

THIS WEEK: ANOTHER GIFT TO EVERY READER

Popular Wireless

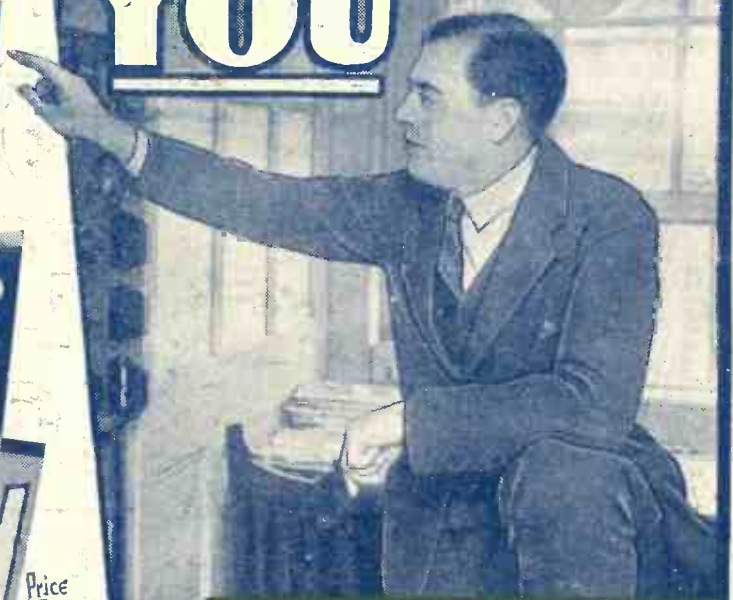
Every Thursday
PRICE
3d.

No. 540. Vol. XXII.

INCORPORATING "WIRELESS"

October 8th, 1932.

An ECKERSLEY BOOK for YOU



Also Inside:
 WHAT I SAW AT MANCHESTER
 THE "P.P." AMPLIFIER
 "HOTTING UP" A ONE-VALVER
 THE GERMAN RADIO SHOW
 and
 MORE ABOUT THE "APEX"

Whether it's bought
 Or whether it's built,
 Earth your Receiver
 By fitting a **FILT!**

GRAHAM FARISH FILT
 PERCOLATIVE CHEMICAL EARTH

If you cannot readily
 obtain a **FILT** from
 your radio dealer order
 direct, post free, from
 sole manufacturers:
**GRAHAM FARISH,
 LTD.,**
 181, Masons Hill
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PRICE
2/6
COMPLETE

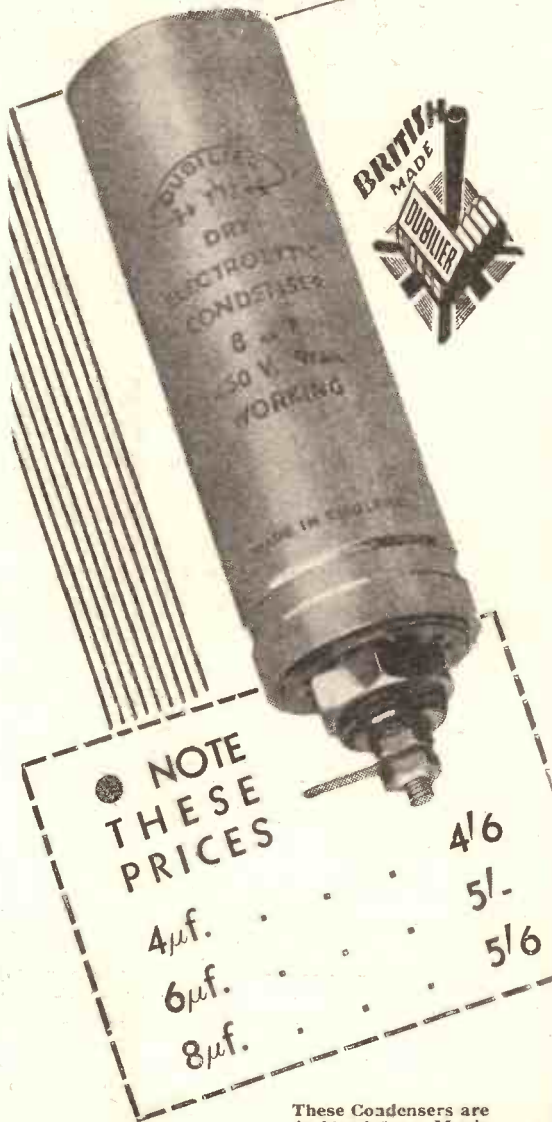
APART FROM
LOW PRICE ...

There
are

6

QUALITY
REASONS

Have you seen the new
Dubilier Component Booklet,
"Choosing your Condensers
and Resistances"? Ask your
dealer for a copy or write
direct to us.



why you should choose

DUBILIER DRY ELECTROLYTIC CONDENSERS

● NOTE THESE PRICES

4μf.	4/6
6μf.	5/-
8μf.	5/6

QUALITY POINT
No. 2

No Liquid

The electrolyte in these Condensers contains no free water and there can be no splashing or creeping of electrolyte from them. It will not freeze and the condensers can safely be exposed to any extremes of cold.

These Condensers are designed for a Maximum Peak Voltage of 450 (D.C. & A.C.)

DUBILIER CONDENSER CO. (1925) LTD.,
Ducon Works, Victoria Rd., N. Acton, London, W. 3



NEW MONKEY GLANDS!

The pros and cons of rejuvenation of the human species is still open to argument, but there is *no doubt* about new life and energy being given to your old set if you modify and bring it up to date with one or more of the new Bulgin components.

These pictorial diagrams show the connections in a simple and straightforward manner, but if they are *not* quite clear to you or you require any further information on Bulgin Products drop a line to our Free Technical Service. They will be pleased to help you to get

BETTER RECEPTION.

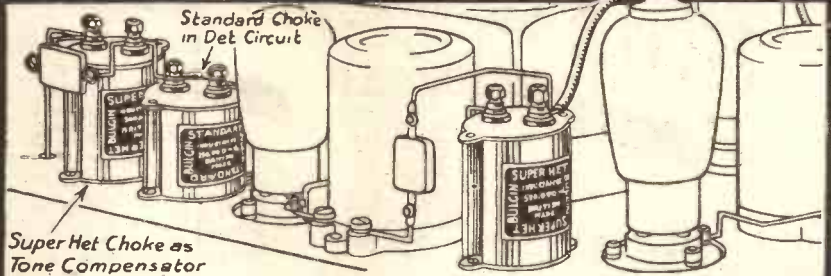
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2d POSTAGE



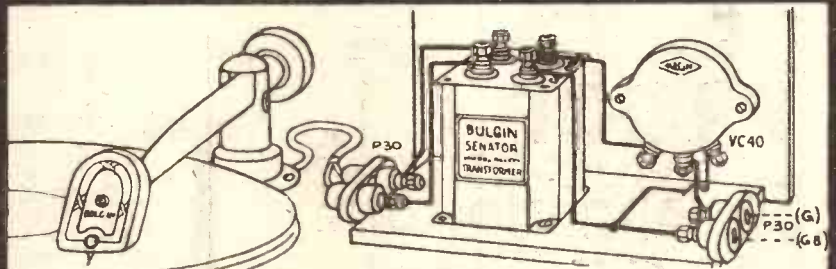
FOR ALL SCREENED CIRCUITS



The Bulgin "Super-Het" Screened H.F. Choke has the amazing inductance of 500,000 mH. (0.5 H.). It therefore has a very high impedance, even on the higher long-waves, and may be used in the intermediate-amplifier of a super-het. receiver in any position. The "Standard" Screened H.F. Choke has an inductance of 250,000 mH. and may be used in less important positions or in the anode circuit of any detector valve. Both may be used for tone control circuits with either resistances or condensers in series.

**SUPER-HET
H.F. CHOKE**
5/6
STANDARD Do.
3/6

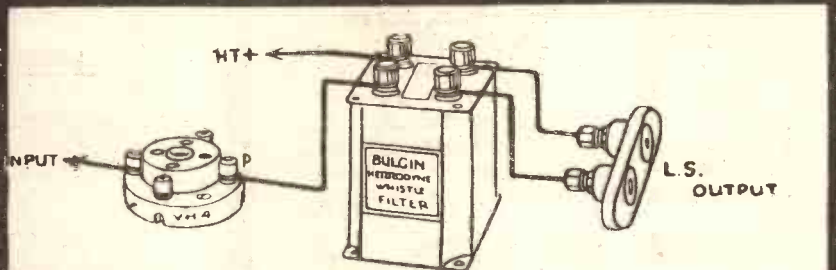
TREBLE YOUR AMPLIFICATION



If you are not getting sufficient amplification from your pick-up here is a way to overcome the difficulty without fitting another valve. Connected as shown the "Senator" will treble the voltage output of any pick-up. This illustration is shown as a made-up unit, but the transformer can be accommodated inside the cabinet and the Volume Control omitted, although advisable in most cases. Its response curve being straight from 50 to 6,000 C.P.S. it cannot distort the pick-up's output under these conditions.

**SENATOR L.F.
TRANSFORMER**
6/9

THAT ANNOYING WHISTLE



Don't let your enjoyment of a good programme be spoiled by that nerve-racking high-pitched steady note known as a heterodyne whistle. Its existence is due to two fairly high-powered stations working on wave lengths not widely separated. The Bulgin Whistle Filter will definitely remove this whistle from your loudspeaker reproduction if connected as shown. Type "A" has a cut-off of 3,250 C.P.S. and is for use with moving-iron type speakers. Type "B" with a cut-off of 4,750 C.P.S. is best suited for moving-coil speakers.

**HETERODYNE
WHISTLE FILTER
TYPES 'A' & 'B'**
10/6

A.F. BULGIN & Co. Ltd. ABBEY Rd. BARKING, ESSEX GRANGEWOOD 3266 & 7



Cap. Mfd.	D.C. Voltage	
	WORKING	PEAK
4	440	460
7	460	500
8	440	460

PROOF in tangible form of T.C.C. research

IN these aqueous electrolytic condensers is seen one of the results of T.C.C.'s research in tangible form. They represent the very latest development in condenser practice—again T.C.C. lead the field—as they always have for the past 25 years.

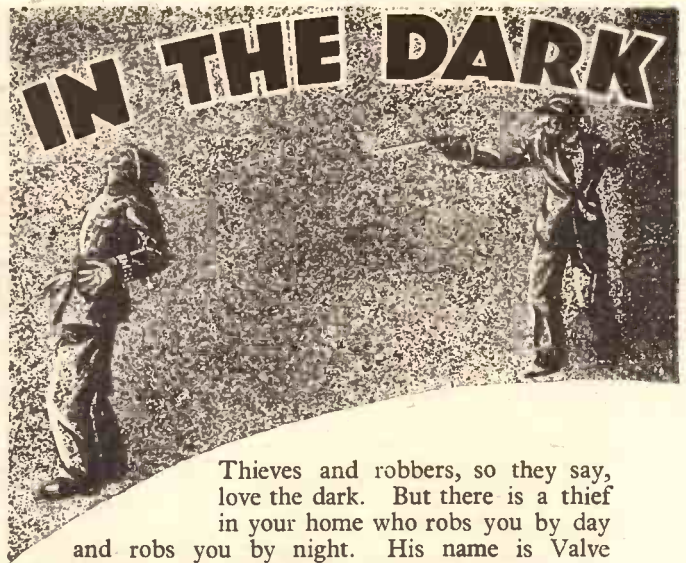
So complete is the T.C.C. organisation, with its experimental and test laboratories, its advanced manufacturing facilities, that every possible demand of the experimenter, the amateur and commercial set designer can be quickly met. A small mica condenser—a high voltage paper condenser or any condenser for a special purpose and T.C.C. are equipped to produce it. That is T.C.C.'s interpretation of service—and your assurance of a perfect product.

T.C.C.

ALL-BRITISH
CONDENSERS

The Telegraph Condenser Co., Ltd., Wales Farm Road, N. Acton, W.3

♥1349



Thieves and robbers, so they say, love the dark. But there is a thief in your home who robs you by day and robs you by night. His name is Valve Deterioration. He is one of those despicable sort of thieves who robs you a little at a time. You can't see him and, unless you have a very quick ear, you won't hear him until . . .

Until one day you realise that your wireless reception has "gone off." It isn't giving you the same enjoyment as before. Suppose you could put your receiver alongside the same instrument when you first bought it. You'd know then. You'd be astonished at the loss of purity and tone value it has suffered. Valve Deterioration has "put one over on you."

But you can get back on him. Fit a set of ETA valves and your set will be as good as ever it was—or even better. ETA valves will bring back its purity and beauty of tone—they will even improve its selectivity and let you hear distinctly and pleasantly stations that were shrieks or unintelligible mutters. ETA valves are as high in quality as any valve can be. They give and maintain perfect reproduction. Yet for all that they cost less to buy.

YOU NEED NEW VALVES
GOOD VALVES—ETA VALVES



ETA

THE INTERNATIONAL VALVE

PRICES FROM
5/6

SERVICE COUPON

To the ELECTRICAL TRADING ASSOCIATION LTD., Aldwych House, Aldwych, London, W.C.2.

A. Please let me know the correct type of ETA valves to replace my present valves which are as under

1..... 2..... 3..... 4..... 5.....
(Insert type letters and number)

B. Please advise me which ETA valves to use for the following receiver or circuit.

Specify Type No. and Name.....

Name.....

Address.....

P.W. 8.10.32.

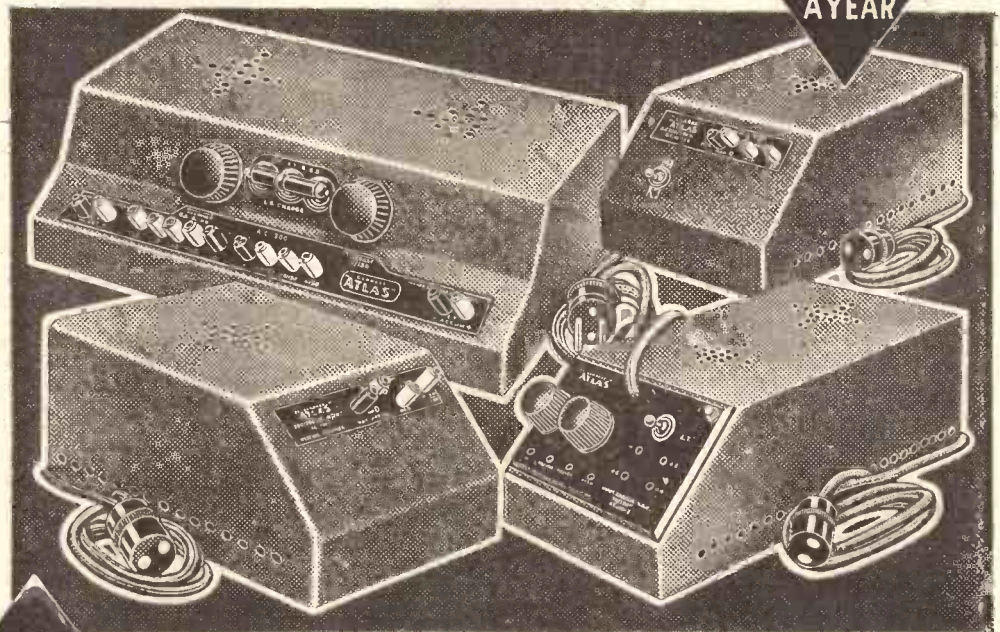
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A YEAR

**H.T. BATTERIES & CHARGING
COST YOU 50/- A YEAR ...**

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FOR LESS THAN 4/- A YEAR**

4/-
A YEAR



MODELS
FOR
EVERY SET
for

10/-
DOWN
AND BALANCE
IN EASY
MONTHLY
PAYMENTS

WHY tolerate the continual cost and trouble of battery renewals and accumulator charging? Why pay more than ten times too much for inferior radio?

With electric light in the home you can cut running costs to less than a penny a week and get better and really reliable reception into the bargain.

Ask your dealer to demonstrate "ATLAS" Mains Units. There's a model to make every battery receiver mains-operated without alterations to set or valves. A.C. Models with Westinghouse Rectifiers from 52/6. D.C. Models from 39/6. Guaranteed for 12 months. Post coupon now and be sure to insist on "ATLAS," the Olympia Ballot winners.

POST NOW!

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George Street, Patricroft, MANCHESTER.

Please send FREE copy of Folder No. 68, fully describing "ATLAS" Mains Units and Components.

Name.....

Address.....

30/8/10

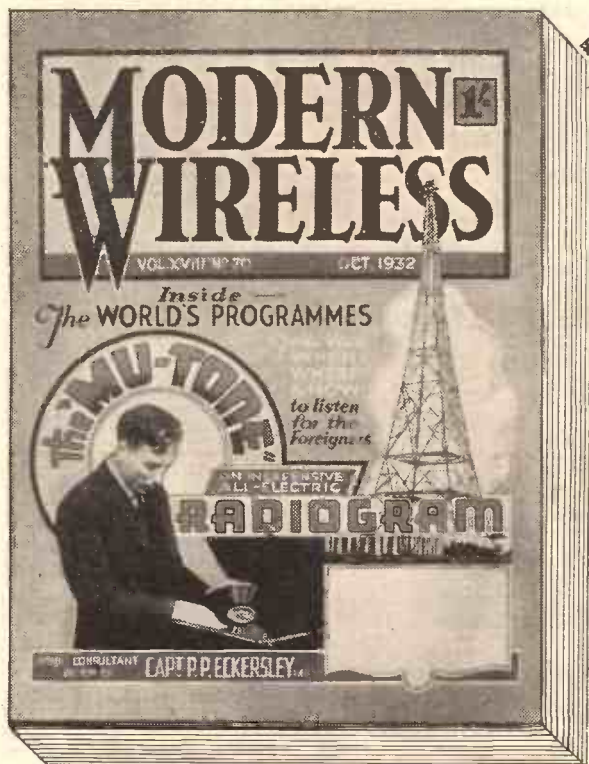
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ATLAS"
MAINS UNITS**

**H. CLARKE & CO. (M/CR.) LTD.,
George Street, Patricroft, Manchester**
London Office: BUSH HOUSE, W.C.2.

Keep your eye on

- ☐ MODERN WIRELESS—always right up to date with all the latest broadcasting developments.
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- ☐ MODERN WIRELESS has a special section devoted exclusively to the home constructor and set builder.

BRITAIN'S LEADING
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◆

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a magnificent practical section containing complete constructional details of two big sets.

- "The Mu-Tone" —a three-valve, variable-mu radio-gramophone.
- "The D.C. Diodion" —a D.C. mains version of an outstanding receiver with diode detector.

◆

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On the Short Waves.
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At Your Service.
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"THE WORLD'S PROGRAMMES"
acknowledged to be the finest foreign programme feature in radio journalism. Tells you everything there is to know about foreign broadcasting stations, programmes and personalities.

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CASH — C.O.D. — or H.P.

● IMPORTANT
Part Kits, miscellaneous components or accessories are available Cash, C.O.D. or under our Easy Way H.P. System. Send us a list of your wants. We will quote you by return without any obligation. All orders over 10/- sent Carriage and C.O.D. Charges Paid.

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Author's Kit of specified components including ready drilled panel and terminal mounts, but less valves and cabinet.

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Or 12 monthly payments of 7/3. Carriage Paid.

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One Set of Valves £1/12/3 One Specified Cabinet 15/-

● FINISHED INSTRUMENT

Fully Assembled, Aerial Tested, Complete with Valves and Cabinet, excluding batteries. Royalties paid. **CASH or C.O.D.**

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These are the parts the author used

	s. d.
1 Baseboard, 14" x 10"	1 0
1 PETO-SCOTT Panel, 14" x 7", ready drilled	4 0
2 COLVERN screened coils, type T.D.	17 0
1 TELSEN .0003-mfd. solid dielectric reaction condenser	2 0
1 TELSEN 3-point wavechange switch (push-pull)	1 3
1 TELSEN 2-point wavechange switch (push-pull)	1 0
1 BULGIN on-off switch, snap type, S.102	1 3
3 BENJAMIN valve holders	2 6
1 FERRANTI .0003 mfd. fixed condenser, mica type	1 6
1 T.C.C. .0002-mfd. fixed condenser, type 34	1 6
1 DUBILIER .0001-mfd. fixed condenser, type 610	1 3
1 FERRANTI 2-mfd. condenser, type C.2	3 9
1 TELSEN 1-mfd. condenser	2 3
2 ORMOND No. 6 .0005-mfd. slow-motion variable condensers	13 0
1 FERRANTI 2-meg. grid leak with holder	1 6
1 GRAHAM-FARISH 30,000-ohm resistance	1 6
1 DUBILIER 200,000-ohm resistance, 1 watt type	1 0
1 READY RADIO H.F. choke, S.G. type	5 6
1 LISSEN Hypernik L.F. transformer	12 6
4 BELLING & LEE indicating terminals	10 6
1 Wiring, sleeving, screws, etc.	1 6
1 Piece of copper foil, 10" x 5"	1 0
2 G.B. plugs	4

KIT A, Cash or C.O.D. £3 19 0

Lissen Tone Compensator 10/- extra if required.

PILOT ALTERNATIVE KIT CHOSEN FROM EDITOR'S LIST

COMPLETE KIT PRICES

KIT "A" 68/-

Alternative Editor's Kit including Ready Drilled Panel and Terminal Mounts but less Valves and Cabinet.

CASH or C.O.D. Carriage Paid.

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Or 12 monthly payments of 10/7

One Set of Valves £1/12/3 One Specified Cabinet 15/3

DETAILED LIST OF PARTS

	s. d.
1 Baseboard, 14" x 10"	1 3
1 PETO-SCOTT Panel, 14" x 7", ready drilled	4 6
2 COLVERN screened coils, type T.D.	17 0
1 TELSEN .0003-mfd. solid dielectric reaction condenser	2 0
1 PETO-SCOTT 3-point wavechange switch (push-pull)	1 3
1 PETO-SCOTT 2-point wavechange switch (push-pull)	1 0
1 BULGIN on-off switch, snap type S.102	1 3
3 JUNIT valve holders	2 0
1 T.C.C. .0003-mfd. fixed condenser, type "M"	1 0
1 T.C.C. .0002-mfd. fixed condenser, type "M"	1 0
1 T.C.C. .0001-mfd. fixed condenser, type "M"	1 0
1 PETO-SCOTT 2-mfd. condenser	3 0
1 PETO-SCOTT 1-mfd. condenser	2 0
2 ORMOND No. 6 .0005-mfd. slow-motion variable condensers	13 0
1 DUBILIER 2-meg. grid leak (wire end)	1 0
1 DUBILIER 30,000-ohm resistance	1 0
1 DUBILIER 200,000-ohm resistance, 1 watt type	1 0
1 PETO-SCOTT H.F. choke, S.G. type	3 6
1 R.L. DUX L.F. transformer	6 9
4 BELLING & LEE indicating terminals	10
2 Terminal strips, connecting wire, screws, one piece copper foil, 10" x 5", two G.B. plugs	2 6

£3 8 0

Lissen Tone Compensator 10/- extra if required.

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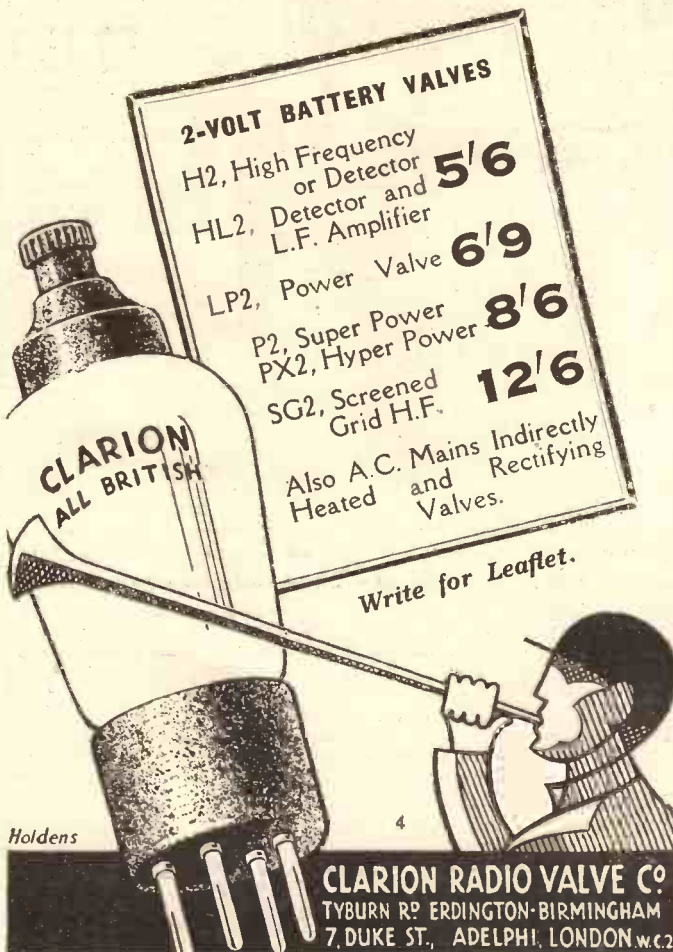
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 bring in the distant stations—definitely

Put a Clarion Screened-Grid Valve in your set and note the difference: elusive foreign stations come in at all points of the dial.

The reason is to be found in the high amplification of the Clarion Valve.

Ask your dealer for Clarion Valves. There is a type for every stage, and Clarion Valves cost less.



2-VOLT BATTERY VALVES

H2, High Frequency or Detector	5/6
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efficiency of an A.C. if it is fitted with

WESTINGHOUSE METAL RECTIFIER

—the only rectifier to high efficiency. Write

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- COSSOR MELODY MAKER.** Model 335. Complete with valves, speaker, and cabinet. Cash Price, £7/17/6. Carriage Paid. Balance in 11 monthly payments of 14/10. Send 10/- only
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- GARRARD INDUCTION GRAMOPHONE MOTOR.** For A.C. Mains. Model 202. Mounted on 12-inch Nickel Motor Plate with fully automatic electric starting and stopping switch. Cash Price, £2/10/0. Carriage Paid. Balance in 11 monthly payments of 4/7. Send 4/7 only

YOU SAVE 5/-

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MODEL 92 Build your existing set into this beautiful Oak Cabinet, which is designed ready to take your present Set, Gramophone Motor, Pick-up, so that you may convert your receiver to a modern Radiogram. Constructed with lift-up lid and ready vigneted upper front. Fitted with Baffle-board and either Blue Spot 100U or Peto-Scott P. M. Moving-Coil Speaker, ready mounted. Dimensions: 3 ft. 2 in. high, 21 in. wide, 15 1/2 in. deep; 18 x 8 in. panel; 18 x 14 in. baseboard. Speaker Compartment: 18 ins. high x 17 in. wide x 14 in. deep with room for all batteries or mains equipment.

PETO-SCOTT'S SPECIAL OFFER
Fill in the Special Coupon below for this beautiful Radiogram Cabinet AND **92/-** SAVE 5/-

Fitted with Blue Spot 100U or Peto-Scott Permanent Magnet Moving-Coil Speaker to choice. **CASH or C.O.D. Remit 87/- only with Special Coupon below.**



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Peto-Scott, the largest Radio-by-Mail House in the world, have decided to release a limited quantity of these Three Special Bargains to NEW READERS OF 'POPULAR WIRELESS'. Each, in its class, represents excellent value, and is backed by the reputation of PETO-SCOTT. Make your choice, save disappointment and fill in the 5/- Coupon NOW.

PETO-SCOTT IMPERIAL CABINET *Registered Design.*

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Garrard Double-Spring Motor. 12 in. Turntable. Automatic Stop. B.T.H. Tone-Arm with Pick-up and Volume Control complete. Automatic Needle Cup. **£7-15-0**
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MODEL ELECTRIC 815 MOTOR
Collaro Induction Motor with Tone-Arm, Pick-up and Volume Control in one unit. 12 in. Turntable. Automatic Stop. Automatic Needle Cup. **£8-15-0**
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1932 KELSEY SHORT-WAVE ADAPTOR

Tunes in the short-wave stations on your existing set. Plug the Kelsey Short-wave Adaptor into the Detector Valve-holder of existing set—it fits without any alteration. No extra valve required; no extra apparatus. Ready for immediate use, and sold complete with Dial Calibration Chart and simple tuning notes, specially compiled by our short-wave expert.

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Fill in the special coupon below for this wonderful Short-wave Detector Unit—thousands of which are already in use throughout the world and YOU SAVE 5/-.

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Fill in the special coupon below for this latest type cabinet speaker and YOU SAVE 5/-. Fitted with Blue Spot 100U, or Peto-Scott Permanent Magnet Moving Coil to choice.

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In handsome Walnut cabinet with Walnut inlaid contrasting veneers. Hand French polished. Carefully designed of specially chosen wood to provide the perfect acoustic conditions necessary for the correct rendition of the upper and lower musical frequencies.

SEND THIS COUPON—IT IS WORTH 5/- TO YOU

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ADDRESS _____

P.W. 8/10/32

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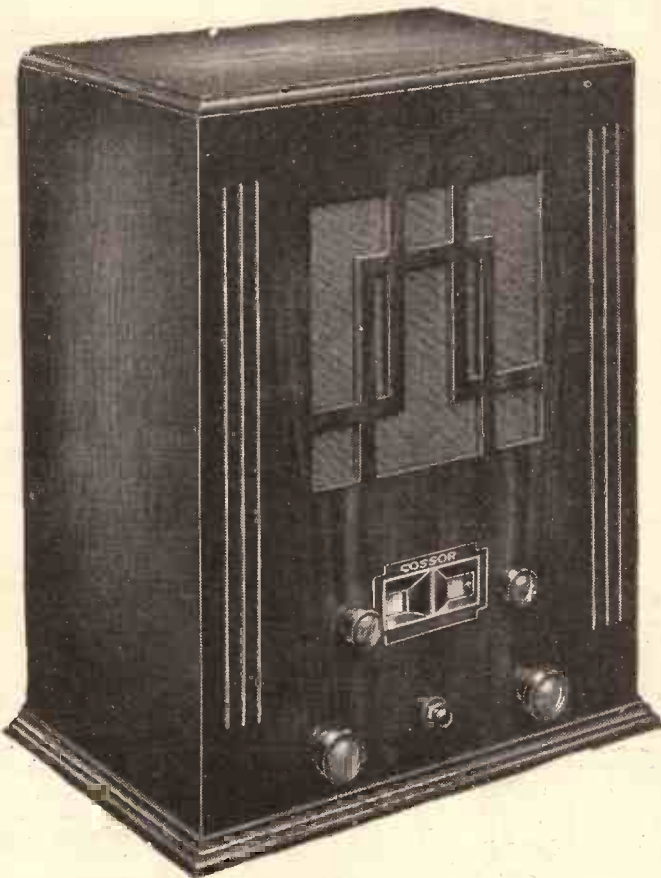
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P.W. 8/10/32

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Get a free Constructional Chart which tells you how to save money by assembling the Cossor Melody Maker at home—no wireless knowledge is necessary—use the coupon.

BATTERY MODEL 335

with Self-Contained Loud Speaker

Kit of Parts includes Cossor 220 V.S.G. Variable-Mu Metallised Screened Grid, Cossor 210 H.L. Metallised Detector and Cossor 220 P. Output Valves, Individually Shielded Coils, Cossor L.F. Transformer: All-metal Chassis and all parts for assembling the Receiver as illustrated; handsomely finished cabinet 18½ in. high, 13½ in. wide, 10½ in. deep and 10 in. Balanced-Armature Loud Speaker with rear adjustment. Provision is made for fitting Gramophone Pick-up Socket and Plug. Price

£7.17.6

Hire Purchase Terms: 17/6 deposit and 9 monthly payments of 17/6

MODEL 334

Kit of Parts, identical with Battery Model 335 except that no loud speaker is supplied. Handsomely finished cabinet 9½ in. high, 13½ in. wide, 10½ in. deep. Price

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ALL-ELECTRIC MODEL 337

with Self-Contained Loud Speaker

Kit of Parts includes Cossor M.V.S.G. Variable-Mu Metallised Screened Grid, Cossor 41 M.H. Metallised Detector, Cossor 41 M.P. Output and Cossor 442 B.U. Rectifier Valves, Individually Shielded Coils; Cossor L.F. Transformer; All-metal Chassis; Cossor Mains Transformer and all parts necessary for assembly. Handsomely finished cabinet 18½ in. x 17½ in. x 10½ in. Balanced-Armature Loud Speaker with rear adjustment. Provision for fitting Gramophone Pick-up Plug and Jack. Price

£11.15.0

Hire Purchase Terms: 25/- deposit and 11 monthly payments of 21/-

MODEL 336

Kit of Parts, identical with All-Electric Model 337 except that no loud speaker is supplied. Handsomely finished cabinet 10½ in. high, 17½ in. wide and 10½ in. deep. Price

£9.15.0

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To A. C. Cossor Ltd., Melody Dept., Highbury Grove, London, N.5.
Please send me free of charge a full size Constructional Chart that tells me how to build the Cossor ^{Battery} ~~All-Electric~~ Melody Maker.
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Scientific Adviser:
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**"P.W." WINS THE CIGAR.
 KEY TO KNOWLEDGE.
 WALES, LOOK YOU!
 COLD, HARD WORLD.**

RADIO NOTES & NEWS

**UP IN ARMS.
 NO ENGLISH CORNS.
 STUDIO SIGNALS.
 WIRELESS NO MIRACLE.**

Readers' Red Letter Day.

WITH this issue we present each reader of "P.W." with a book by Capt. Eckersley, and I venture to prophesy that we thereby win the cigar or nuts. By the time that they have read this treatise—and how "readable" it is!—beginners will walk about horribly bloated with knowledge, and old-timers will be secretly packing facts away in the jolly old brainpans, for use when required. It's the scoopiest scoop ever.

Reliable Retorts.

YOU may be quite confident that these Eckersleyan retorts to readers' queries are top-notch, reliable, and based on a long and practical experience of radio engineering. If each query had been medical instead of electrical, and had been addressed to a Harley Street specialist, the value of the replies would amount to hundreds of pounds.

In this booklet you have the key to knowledge which has been acquired by years of practice and study. It is unique. It is worth binding in half calf and leaving to your next-of-kin.

No text book in the world contains just this sort of information written in so luminous a manner. In short, "P.W." has "done it again."

My Welsh Trip.

IN reply to a number of people who have written from Wales—including an Englishman in Swansea, who says that his blood is boiling—I would say that the head and font of my offence is simply that I did not feel "at home" in Wales, though

I gathered first-hand impressions about the Welsh desire for a National station, and supported that desire in these columns. I praised the Welsh's love of singing, and their choral exploits, and admired their front-garden aerials.

All the rest was derived from readers' letters. Boys, please don't be so touchy. And tell me, why has Caernarvon planted its statue of Mr. Lloyd George bang on top of an underground public lavatory? Is it a Welsh joke?

dense of certain things which are done in schools is another matter and highly commendable, chief among those things being the time-wasting radio "lessons."

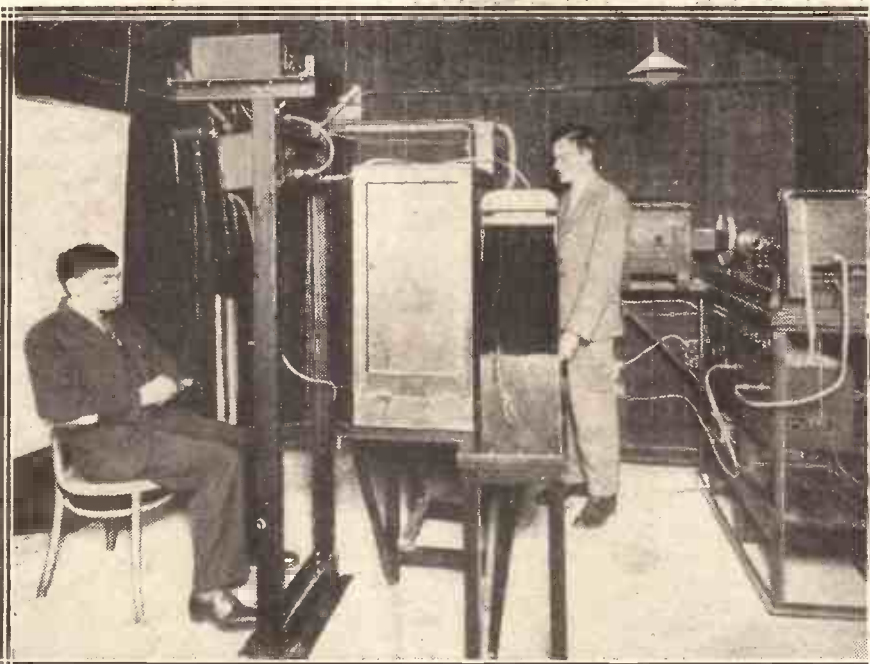
I hope that he will frown upon the attempt to oust the teacher, to annoy the teacher, to insult the teacher, to injure the pupil, to bore the pupil, by the introduction of radio lectures on subjects of no practical value to the proletariat which has to carve a living out of this cold, hard, business world.

More Intense Nationalism.

HEAVENS! The tribes are up in arms this week, no mistake. An Aberdonian (J. Q.) who has returned from Canada is inclined to plump for Home Rule to abolish the "evil" of the singing of Scottish songs by Englishmen, via the B.B.C. microphones.

Even if we grant that the singing of Scottish songs is of paramount importance, devolution seems to me a rather drastic method of securing the correct Scottish twang to "Annie Laurie," etc. I believe that I have by now accumulated enough evidence to warrant my making this aphorism: "The only people on earth who have no corners are the English."

THE CHELMSFORD TELEVISION TESTS



These are the transmitters used at an experimental station at Chelmsford to televise greetings to York during the visit of the British Association to that city. The apparatus on the right sends news messages which appear at the receiving end in the form of writing on a screen.

A Chance for Lord Irwin.

LORD IRWIN, having been appointed President of the Board of Education, is understood to be contemplating the introduction of economies. Some people would say that any economy at the expense of elementary and secondary education is false and pernicious, and to this I should heartily assent. But economy at the ex-

The Olympia Robot.

BY way of a cocktail, swallow the following "facts" about the Radiolympic Robot as dished up by a Sunday paper. Cost, £6,000. Took fourteen years to create. With a robot, an armoured car and a machine-gun could annihilate an army corps. That's enough to go on with!

(Continued on next page.)

"ARIEL'S" RUNNING COMMENTARY ON RADIO (Continued)

By far the commonest error which has been made in references to this Robot is that of comparing it to "Frankenstein," the monster who turned and rent its creator, in Mrs. Shelley's famous story. But it was the monster's creator whose name was Frankenstein! I correct hereby some of the most famous newspapers.

Dealing with the Dealers!

"THEY will sell you anything, these dealers," says the writer of an extremely unjudicial and invigorating article I came across recently.



And he goes on to talk of the "helpless, blundering ignorance of ramping profit-taking money-snatchers who pretend they are experts!"

Warned by this eloquence, he proceeds to denounce

all "fumlbers who look for a fault and fuse your mains in failing to find it."

"Never before," it appears, "have scientific instruments been mauled and man-handled by such ham-fisted boobs as these."

I wish I could repeat more of it—lovely, deep-chested stuff, spoken straight from the full heart of somebody who has been well and truly stung!

The "W.L.S." One.

T. J. S. (Ontario), who is going to make an edition-de-luxe of the "W.L.S."

One, asks what are the functions of the two dials and the knob. He hazards the guess that one dial is "tuning" and the other "reaction," and asks if the knob is a vernier, potentiometer—or what. Why T. J. S. asks "Ariel" this, instead of the designer of the set, is explicable only on the supposition that he believes that I have a supernatural knowledge of W. L. S.'s mental processes.

T. J. S. also casts a pretty broad hint that I should disclose W. L. S.'s identity. Sir, he is William Longfellow Shakespeare.

Duck Island Sensation.

ACCORDING to the "Irish News," a septuagenarian who has taken up his abode in a wood cabin on Duck Island—one of the tiny islets on Lough Beg—has received a surprise in the form of a complete wireless set, the gift of an anonymous lady donor!



Calling all his pals from the mainland to his assistance, the old man has concocted a letter of thanks to

his unknown benefactor, and has managed to get the set working up there on Duck Island to the astonishment of all aforesaid pals and beholders.

But I wonder what he really thinks about one of the wisecracks he hears!

Wireless for Mines.

REFERRING to the experiments in communication between coal-face and pit-head at Wakefield, a newspaper leaderette says that it seems strange that up to now no one has thought of using wireless for that purpose.

It would be very strange indeed if no one had thought of such an obvious application of radio, but the fact is that for years it has been the subject of experiments both here and in America. It is easy to think of—but difficult to accomplish, and practical mining men will know what those difficulties are.

However, I suppose that one day the obstacles will be overcome or dodged. The chief trouble is—when there is a disaster, where is the miner and where is his radio set? Two different places!

"SHORT WAVES"

A German scientist, working on the assumption that moths communicate by wireless, is said to have discovered the wavelength and to have attracted the moths with a transmitter.

It would be interesting to know whether he has noted the reactions of these creatures to a loudspeaker when a dress-suit has been at the microphone.—"Punch."

It has been suggested that an underground "aerial" is incorrectly named, and should be called a "burial."

What a come-down!

A listener, writing to a daily newspaper recently, said: "We are not the cause of the interference because we have a private earth." Evidently a monopolistic landowner on a very large scale.

Dr. A. H. Pirie, of Montreal, has demonstrated that, by means of an X-ray fuse, printed matter held upside down can be read in a darkened room through closed eyelids. Television enthusiasts, take hope.

"Love was once a little boy (Unaccompanied)."—Wireless Programme. But not for long.—"Punch."

"The entertainment at the Radio Manufacturers' Association banquet will last two YEARS," we read in the "Seattle Times." This certainly is a victory for radio over time and space.

REVENGE.

If the B.B.C. gets through to Mars, Look out for electrical jars; For if Martians should hear Their programmes—I fear They'll make this old planet see stars!

America Prophecies.

MR. HUGO GERNSBACK, well known here and in the U.S.A. as a scientific journalist and publisher, being in Europe for a rest, has filled in his spare time by prophesying some of the most horrible things one could imagine. He envisages transatlantic flights in even minutes, evidently having thought of a means of overcoming the calorific effects of air friction.

But his best flights of fancy relate to flights to the other planets and the colonisations of inhabitable planets. Mine is a more mundane mind and evolves visions of steak pudding, brown ale, the Kentish downs, cricket matches, autumn woods, fox-terriers, books, fireside, fog and England. I give all the planets to Mr. Gernsback, with my blessing.

Tramway Interference.

IF a clumpetty, clacketty old tram which has been running for years down the High Street without hurting anybody is suddenly accused of causing electrical interference with radio reception, who ought to pay to put it right?

The man who owns the set? Or the tramway owners? Or the B.B.C.? Or who?

Reporting to the Sheffield City council not long ago on a question of this kind, the General Manager of the Corporation Tramways there gave it as his opinion that it was up to the Post Office to pay for the cure.

He neatly showed that the Post Office, who collects radio licence-money, always works on the principle that second-comers always ought to pay for interference with first-comers in the case of telegraphs, telephones, etc.—and the trams were the first-comers in this instance.

All very feasible, the way he put it.



Weighty Pronouncement.

THERE is a journalist whose name rhymes with "quaffer." He wears a voluminous cloak, like Chesterton, and a worried look like "Ariel" on quarter day. This person visited Radiolympia, looked at it, and thereafter set down his impressions of it. Hear him.

"Wireless is such a miracle to-day that it has ceased to be one." Anybody who is able to explain what that means—is a miracle. In passing, let me say that wireless is not a miracle. I will defend that statement against all-comers.

Finally, our journalist, aforementioned, says, "Two years ago I went down to the Radio Show with Sophie Tucker. I was impressed." For heaven's sake, man—what did Sophie do to impress you? Tell us!

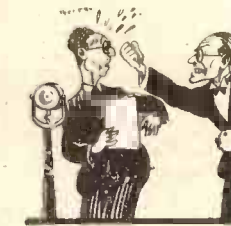
Signs in the Studio.

I LIKE this "hand language" which some enthusiast has compiled for radio studios. It is used with great gusto by radio producers in America.

Two thumbs up-lifted means "Come closer to microphone."

Two fingers, opening and closing scissors fashion signify "Cut the programme."

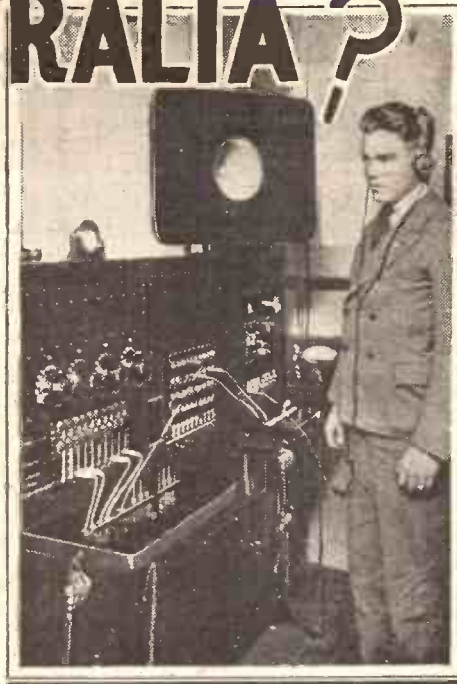
There are lots of other signs, including a closed fist, which means "play louder." But this one seems to me to be a poor example. For the closed fist—especially if placed about 1½ inches from somebody's nose and accompanied by suitable glowering—really means "Buzz off—I don't like you!" And is so interpreted the whole world over!



ARIEL.

LONG WAVES for AUSTRALIA?

by Capt. P. P. Eckersley



WAR! Awful war!
There's me on the one hand—the Post Office on the other—long waves for broadcasting! Joke! Dark laughter—Homeric in intensity—6 decibels up on the higher frequencies.

Yes! I know! You want to hear what it's all about.

I came out here to advise Amalgamated Wireless—the Marconi Company as it were of Australia—on Australian broadcasting. So I took a map of Australia, I looked at its population density, I studied the power location and wavelengths—yes, particularly the wavelengths—of the existing stations, and calculated a few quantities.

You can say that to-day only about 55 per cent of the Australian population gets a signal like that which is spread over 90 per cent. of Europe. There is, in fact, a passable service for the town listener and none for the country or rural listener. The latter gets a fading-after-dark signal and lots of atmospherics.

I found that the Government, who runs broadcasting in Australia, proposed to try to extend the service to the country listener by using medium, *not* long waves. I

assumed their scheme and found they would cover only 3 per cent of the inhabited area of Australia, and that they would spend £750,000 (about what we are spending on our Regional Scheme) to do it.

A Gift Refused.

So I proposed an Australian Regional Scheme, costing very much less than £750,000, which would serve 90 per cent—yes! 90 per cent—of the inhabitants of Australia.

I felt myself a public benefactor.

There was my knowledge, unchallenged in Europe, put freely at their disposal and I expected those concerned to thank me.

Thank me! My dear listener, the Government were so quick in their reply that, before reading my report, they

 How would you like to have to advise a whole Continent on its broadcasting? That was the responsibility that confronted Capt. P. P. Eckersley, "P.W.'s" Chief Radio Consultant, when he visited Australia recently, and below he tells readers how he tackled that tremendous task, and the interesting conclusions at which he arrived.

rushed into print and said *they* weren't going to do *anything* along the lines I proposed. See a government *do* anything—no! Listeners might rest assured that *they* weren't going to take expert advice.

I became a little worried about this. In Europe, as you know, every postal adminis-

tration would give away all its stamps for the possession of *one* long wave. In Australia, where, thanks to Australia's geographical isolation, they can use as many as eight, they turn up their official noses at them.

So I replied to the Government—and the Press was and is full of our arguments.

I say, "Here is a priceless boon to the country listener—free." And the government officials say, "To — with you and your boons; who asked you out here, anyway?" And I say, "Please, Mr. Dilly and Mr. Dally, does that matter, and does my association with a private company (51 per cent of the shares of which are owned by the Government) alter the attenuation of wireless waves over land?"

No! It's a pity. Obviously, long waves were made just for Australia, but because somebody made a perfectly understandable mistake, nobody is big enough to say that now that mistake will be rectified.

Geneva Recollections.

Mark you, the public and the experts are all on my side, they feel it deeply that my recommendations cannot be accepted. Many are determined to see that the debate is continued after I have left. Quite independent people are giving me every support. But it is a pity.

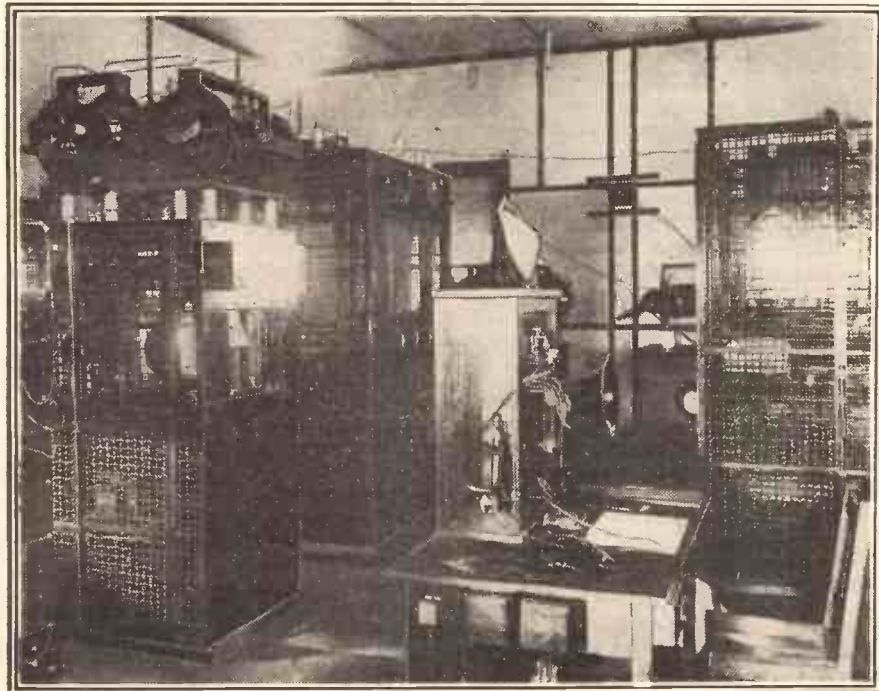
I hate having to go into opposition when the facts are so boringly clear.

But it is funny to remember the days at Geneva when delegates from the postal administrations of Europe fought each other through the long days and nights to obtain or keep possession of a long wave; while here you have a fight to persuade an administration to make use of these so-much-sought-after facilities.

True, the Americans do not use long waves, but why should they, when they want to get the maximum profit? With one 5-kilowatt station they can cover a few million people in a large town, while

(Continued on next page.)

ADELAIDE'S AMPLIFYING APPARATUS



The master oscillator is caged on the left, with the power amplifying stage beside it. In the foreground is the control engineer's table carrying the input switching apparatus.

RECEPTION IN MIDDLESEX

A report from an Uxbridge reader who truly describes his results as "amazing."

THE more I see of listeners' reception reports, the greater grows my conviction that I am situated in an ideal locality for the reception of distant stations upon the medium wave-band.

That my success is not entirely due to the receivers I employ is obvious when I say that the set I use for reception upon the medium wave-band has two screened grid stages, detector, one R.C.C. stage, and a push-pull stage. My short-wave receiver is a modest two-valve receiver, detector and pentode.

My aerial is good, but not exceptionally fine, being slung between two 45-ft. masts. My earth is a sheet of "tin-plate" buried several feet below the surface of the ground.

And yet the results obtained can be described as "amazing."

On the long and medium waves I can almost always receive the following stations at "local" station strength: Radio Paris, Zeesen, Eiffel Tower, Warsaw, Vienna Experimental, Kalundborg, Budapest, Palermo, Brussels No. 1, Prague, Langenberg, Beromünster, Rome, Stockholm, Katowice, Radio Suisse Romande, Frankfurt, Radio Toulouse, Hamburg, Mühlacker, Barcelona EAJI, Milan, Poste Parisien, Paris, Breslau, Genoa, Bratislava, Heilsberg, Trieste, Fécamp, and many others.

Programmes from Burma.

Russian and Spanish stations (with the exception of EAJI, Barcelona) are seldom heard at any great strength by me, although there have been occasions when excellent reception from the East has occurred. Indeed, such excellent reception that I have received, upon the medium waves, far eastward of Russia in Europe, and heard Chinese and Indian (Rangoon) broadcasting.

Fortunately, the deadness towards the eastern part of the globe does not occur to the west, and American stations can almost always be received at good strength during the winter and at moderate to poor strength during the summer.

The most reliable transmissions are WTIC, Hartford, Connecticut; WPG, Atlantic City, New Jersey; WNAC,

Boston, Mass.; and WIOD, Miami Beach, Florida.

However, many other American stations have been received at excellent strength, and I have received well over fifty U.S. and Canadian stations upon the medium wave-lengths.

Fortunately, it is not merely the higher-powered American stations that reach me here, for I have received, and verified from the stations concerned, several 100-watt stations. These include: WGBB, Freeport, N.Y.; WWR L, Woodside, N.Y.; WJAC, Johnstown, Pa.; and WHBY, Green Bay, Wisc.

I have also had excellent reception from Latin-American stations, particularly during the first few months of 1932, and have received stations in Mexico, Cuba, Brazil, Uruguay, and the Argentine Republic.

World-Wide Reception.

The Buenos Aires station LR3, and the Mexican station XED, Reynosa, have provided the strongest signals from these countries.

Although the excellent reception obtained upon the medium waves is extremely attractive it has not "spoiled" me for

short-wave work, for I have received telephony stations from Japan, Philippine Islands, Java, Samoa, Fiji Islands, Australia, New Zealand, India, Indo-China, Siam, Madagascar, Cape Town, Nairobi, Egypt, Madeira, Argentine Republic, Venezuela, Colombia, Honduras Republic, Brazil, Costa Rica, British Guiana, Mexico, Hawaii, U.S.A., Canada, and even a motor-yacht which was sailing somewhere within the Arctic Circle.

Short-Wave Results.

The 49-metre band supplies me with the best "all-round" results, for, during the daylight hours Moscow (Trade Union) and other stations provide excellent signals, and later in the evening W3XAL at Boundbrook is well heard. From 11 p.m. onwards many American stations come in extremely well. These include VE9DR, Drummondville; W9XF, Chicago; 3XA U, Philadelphia; 2XA L and 2XE, New York; HKD, Berrinquilla; and HRB, Tegucigalpa.

Below that wavelength many stations, too numerous to mention, provide entertainment throughout the day and night.

L. W. O.

JACK'S "COOK-HOUSE" CALL



The amusing scene when Jack Payne, who has been holiday-making with his "boys" on the South Coast, played "Come to the Cook-house Door" just before dinner-time.

the cost of serving the few rural listeners would be ever so much greater.

It's only where you have a licence revenue and where you adopt public service bases that the rural listener, paying as much as the town listener, is important. I should shudder to think what would happen if we abandoned Radio Paris, Hilversum, Zeesen, the Denmark station and Daventry in Europe! Would people complain?

Of course, I am an engineer, but I dare at times to have opinions about the organisation of broadcasting and so on.

I have never believed in government broadcasting in any shape or form. I think the B.B.C. represents a very good method of organisation, better than private enterprise and much better than government. You cannot be the body to take

LONG WAVES FOR AUSTRALIA?

(Continued from previous page)

the judicial view and yet, at the same time, pioneer a new art. It cannot and does not work.

So my report on the Australian system suggested a better organisation, suggested that the technical development should be taken away from the government.

This made the Post Office people attack long-wave broadcasting! It's a queer world.

I think our Post Office was excellent when

it opposed every one of my proposals because it made me think and consider and reconsider. But how hopeless it would have been if such opposition had been successful!

I am sure Australia will not have a good system until the government people exalt themselves into a judgmental position, leaving a free and independent body to pioneer the development of broadcasting *ventre à terre*.

Nevertheless I am enjoying my controversy. It's just like old days to find progress held up by the cautious and ill-informed.

But I do believe, truly, that it's a good thing to have all this opposition: my fear here is that it will succeed in denying the Australians a decent service of broadcasting.



What I Saw at MANCHESTER

Albert Square is outside the Town Hall, a most imposing building which we found afterwards was internally a serious rival to the Hampton Court maze. So we hurriedly departed to see the arrival of this wonder procession.

Albert Square greeted us with its customary peacefulness and procession of tramcars; but without any sign of the 100 cars and radio vans.

Obviously "summat" was "up wi' summat." So we repaired inside to ask what was the matter. And thereupon

Our Special Technical Representative describes some of the outstanding features which he saw during a visit to the great Northern Exhibition. Readers who did not visit the Show will find this "the next best thing."

LAST week you read about the adventures of two of the staff of POPULAR WIRELESS at the Northern Radio Exhibition as told by my colleague. Now it is my turn to tell the tale, and I must begin by saying, as he said, that I have been lost.

This time it was more serious than ever, for the mislaying of me by my colleague, or vice versa, did not take place in the show at all, but in a very different part of Manchester.

Upstairs and Downstairs.

Let me begin the story. There are two exhibitions in Manchester, the Radio Exhibition and the Town Hall!

I have thoroughly explored both outside and inside. Both are unique in their own sphere of usefulness. And, strange to relate, it was in the latter that the search-party had to begin its operations.

We had successfully counted the tram crossings on the way to the City Hall, and had duly arrived there shortly before the opening of the Exhibition. We had wandered round the hall watching the finishing touches being put on the stands when someone remembered that the much-advertised R.M.A. convoy from London ("via Bedford and Leicester") was almost due at Albert Square, to be welcomed by the Lord Mayor of Manchester.

BEHIND AN "EKCO" SET



The inside of an M 23 A.C. receiver made by Messrs. E. K. Cole, of Southend.

PERMANENT-MAGNET M.C.



A fine specimen of the modern loudspeaker. It is one of the cabinet models in the Celestion range.

began a search for information that I hope will never be my lot to endure again.

The Town Hall is roughly triangular in design and polygonal in effect. We wandered round and round and up and down the various spiral stairways, asking the few Mancunians we met if they knew aught about aught, but with no success. So we tried a few of the 101 doors that line the corridors.

Here I got lost, and the last I saw of my colleague was his rear light vanishing into the Drainage and Cleanage Department (PRIVATE) while I joined a select committee discussing some remote urban matter in another room.

Thereafter followed successive but not successful visits to the ratepayers' office, highways department, sanitary inspector, corporation tramways, museum, etc., but with no radio result.

The Magnanimous Mayor.

Much more searching took place before I was eventually rejoined by my friend in the presence of the Lord Mayor's secretary, who had been unearthed on the first floor behind double barricades marked PRIVATE (in large caps).

He untangled our problem with the greatest of ease and courtesy. No procession of radio cars was to come in the square, and in any case the Lord Mayor was not going to meet it. Our informants

were wrong, and no such arrangement had been made.

He was sure that a large city like Manchester could not give an official welcome to a trade convoy, even if smaller towns (I believe he was thinking of that provincial village of London) did that sort of thing.

The Mayor would, however, welcome certain members of the R.M.A. in his room on the following day, and we were invited to be welcomed at the same time if we wished.

The Coming of the Convoy.

Happily reunited, we wended our way back to the fifteenth tram crossing from the left and to the City Hall. We saw the convoy had arrived there, and we joined in the enthusiastic crowds of children that greeted its arrival. Unofficial and unostentatious perhaps, but none the less hearty.

(Continued on next page.)

DESIGNED BY VARLEY



An example of modern cabinet work for radio receivers, shown on the Varley Stand.

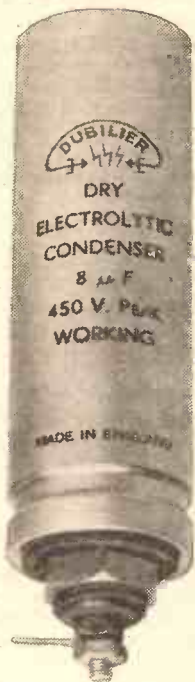
WHAT I SAW AT MANCHESTER

(Continued from previous page.)

One particularly interesting radio carnival car drew our attention. It contained Mollison's airplane "The Heart's Content." This certainly gave promise that it was going to be a good radio show.

We re-entered the hall. Things were in full swing, and from the drab exterior we

8 M.F.D'S FOR 450 VOLTS



A well-made condenser of the large-capacity dry electrolyte type. It is for high voltage working.

were plunged into a blaze of attractive illumination. The multi-coloured stands made a far more pleasing display than the plain officialdom of Olympia. Manchester certainly has it on London in this respect.

The show up North is more intimate, more personal, and more attractive than the giant of the South, and, what is more, we were not asked for our birth certificate, police pass, nor had we to submit to a questionnaire before we were admitted either before the official opening, or at any other time. (Olympia, please note!)

They are glad to see you at the City Hall, not merely tolerant of your presence, and this spirit is reflected, not only by the

officials, but by every member of the public that you meet. Radio is a vital force in Manchester, and there is no denying the success of the Northern Radio Exhibition.

Attractive Colour Schemes.

Those "golden valves" were as big an attraction to the public as they were to me, and you have already heard of my fondness for them. They certainly do look fascinating, hacked as they are by the dark marble and chromium finish of the Mullard stand. Keep an eye open for them all you who can get to the City Hall.

Telsen's red and yellow and Ready-Radio's green and orange stand colour schemes are most attractive, while the Igranic and neighbour's corner of the hall is one of the most attractive I have seen.

Bright colouring predominates everywhere, though the whole effect is one of complete harmony, and not a single eye-offender exists.

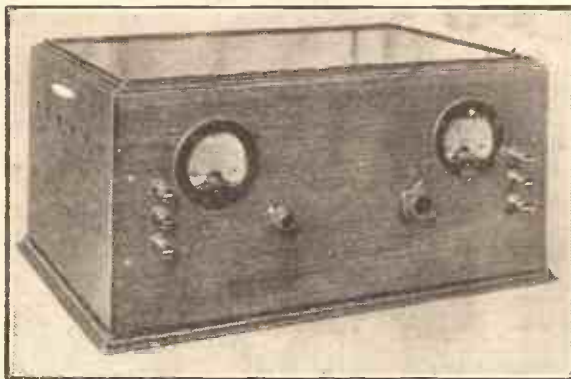
The G.E.C. have an illuminated orange and green blend that is like the entrance to Aladdin's Cave, while by accident (so I am told) all the valve

FOR BATTERY AND MAINS



Two popular Mullard valves, on the left the P.M.12A screened-grid which will work well on low H.T. voltages, and on the right a high-mag. detector of the indirectly-heated type.

A FINE QUALITY AMPLIFIER



To ensure proper operation and so make good quality a certainty, this Ferranti D.C. amplifier is provided with two meters mounted on the panel.

shown. A specially interesting "feature" is the presence on the stand of the famous boy soprano, Ernest Lough, who has joined the H.M.V. staff and is busy answering visitors' technical queries.

The "Apex."

POPULAR WIRELESS readers will be particularly interested in the Ferranti "Apex" receiver which is shown on the Ferranti stand. This is the special constructor's chart version of our latest receiver design, which was introduced to you last week.

Atlas have let rip in their home town with a most attractive blue and yellow stand on which is a very comprehensive display, while the grey and silver scheme of the Philips' contribution to brighter radio shows was much appreciated by everybody.

I could go on and on describing in detail all the various bits and pieces, sets and stands of the large number of firms represented.

(Continued on page 241.)

MARCONIPHONE MAINS MODEL



A particularly fine all-electric receiver known as the 42 A.C.

firms are grouped together. This is most convenient for the visitor, if a little exacting on the patience of the assistants of the various stands concerned.

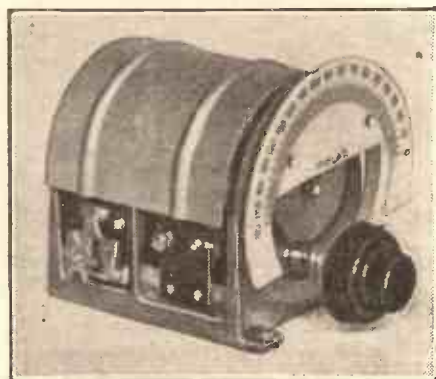
Outside Demonstrations.

You doubtless do not want to read an essay on colour schemes, but I must draw attention to the Ekco stand, with its silver, orange and blue blend. It is certainly one of the best at the show, and is based on the Olympia scheme.

Outside, too, the same firm is giving an excellent programme at the Paramount Theatre, while Marconiphone are doing more magic at the Albert Hall.

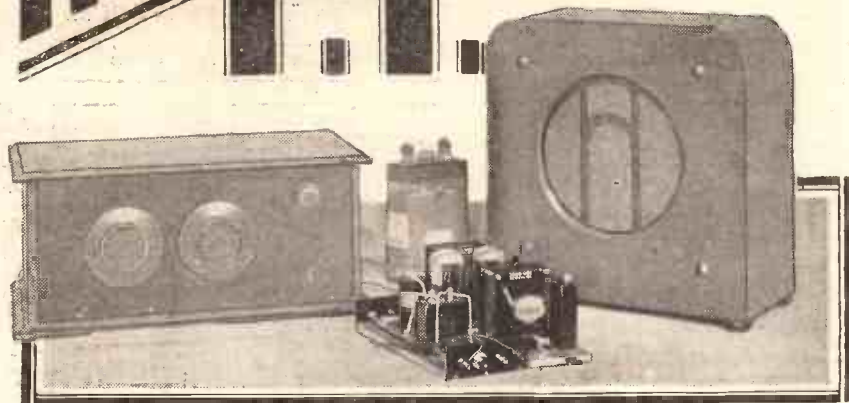
H.M.V. and Columbia are exhibiting on the Trojan Electric Co. stand, and the £300 all-glass radio-gram that was at Olympia has been brought up by special car to take its place among the 17 different models

GANGED AND CANNED



This double-gang Polar condenser is provided with screening as well as a minimum trimmer.

THE "P.P." AMPLIFIER



IN designing an amplifier that will work efficiently after an ordinary broadcast receiver, there are many factors that have to be considered. And when it is desired to run it from batteries, and at the same time have ample power in hand, the problem needs considerable thought.

Recently we have had many requests for an amplifier of this type, so the "P.W." Research Staff, always ready to meet readers' wishes, set themselves the task of evolving a suitable design. It had to be inexpensive, easy to build, economical, powerful and suitable for using after the majority of sets.

Really Big Volume.

Two-valve valves were considered desirable, but how was one to obtain adequate power handling from valves of this class? The largest 2-valve triodes on the market have an output of only about 400 milliwatts, which is hardly sufficient for cases where really big volume is required.

Obviously, then, more than one valve

A very useful and unusually easy-to-build push-pull amplifier that will convert almost any small set into a really powerful outfit, capable of providing sufficient volume to fill the largest room. It can be used with battery or mains-unit H.T.,
 Designed by the "P.W." RESEARCH DEPARTMENT.

had to be used to feed the loudspeaker. Two or more valves could be connected in parallel, but this scheme has the disadvantage that the grid swing would be limited to 16 volts or so, as this is about the limit for 2-volt valves.

It was mainly because of this reason that the push-pull arrangement was decided upon, for when valves are connected in this manner they will take double the grid swing of a single valve without overloading. Thus, if a pair of valves are used

which are each capable of dealing with 9 volts, when joined up in a push-pull circuit they will conveniently take 18 volts between them.

Another Advantage.

Special transformers have to be used, of course, and it is necessary for the valves to be of the same make and type, although they need not be specially matched. A glance at the accompanying circuit diagram will give readers an idea of the scheme.

Push-pull has another advantage besides its power-handling capabilities, for it is much less liable to instability troubles. It also gives greater freedom from hum when mains drive is employed than do valves connected in the more conventional way.

Getting down to the constructional details, it is safe to say that even an absolute novice should not have the slightest difficulty. The whole amplifier is built on a flat baseboard, 7½ in. by 10 in. A panel is unnecessary, and the only pieces of ebonite used in the construction are the two terminal strips.

No Soldering Needed.

The layout is not critical, but the original should be followed as closely as possible, and pains given to the job of wiring up will be well repaid in the appearance and trouble-free working of the finished amplifier. There is no need to solder the joints, unless, of course, you are particularly fond of it!

Screw all the components down well, and it will be found a great help if the screws are "started" with a bradawl, particularly if the wood is on the hard side. Allow plenty of room at the side for the grid-bias battery, which is held firmly in position by a special clip.

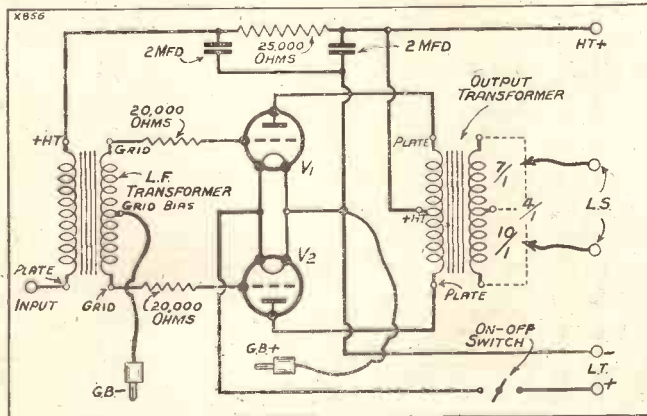
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HERE ARE THE COMPONENTS AND ACCESSORIES YOU REQUIRE

- 1 Push-pull intervalve transformer (Ferranti type A.F.5C, Varley, R.I.).
- 1 Push-pull output transformer (Ferranti O.P.M.5C, Varley, R.I.).
- 1 2-mfd. condenser Lissen, (T.C.C., Dubilier, Ferranti, Igranic, Telsen).
- 1 2-mfd. condenser (Dubilier non-inductive, or where available in above makes).
- 1 25,000-ohm resistance (Colvern strip, Dubilier 1-watt type, Wearite, Graham Farish Ohmite).
- 2 20,000-ohm resistances (Dubilier 1-watt type, Colvern strip, Wearite, Graham Farish Ohmite).
- 2 4-pin valve holders (Lissen, Telsen, Benjamin, W.B., Clix, Ready Radio, Igranic, Wearite, Bulgin, Ferranti).
- Baseboard 10 in. × 7½ in.
- 1 2-point push-pull switch (Lissen,

- Bulgin, Telsen, Ready Radio, Graham Farish, Goltone,
- Wearite, Tunewell, Peto-Scott, Ormond).

SUPER-POWER SIMPLICITY!



The circuit is of unrivalled simplicity, and yet it is capable of real super-power results.

- 6 Terminals (Belling-Lee, Igranic, Clix, Bulgin, Ealex).
- 1 Terminal strip, 4½ in. × 1½ in.
- 1 Terminal strip 3½ in. × 1½ in.
- 1 G.B. battery clip (Bulgin).
- Battery plugs, wire, screws, etc.

ACCESSORIES.

BATTERIES.—H.T. (120-150 volt) super-capacity types are to be preferred (Lissen, Ediswan, Drydex, Pertrix, Ever-Ready, Siemens, Magnet, Marconiphone, Cossor). Grid-bias (voltage depending upon valves in output stage). L.T. (Oldham, Exide, Ediswan, Lissen, Pertrix, G.E.C.).

VALVES.—See separate table.
LOUDSPEAKER.—Blue Spot, Epoch, H.M.V., Celestion, Marconiphone, R & A, Clarke's Atlas, Ormond, W.B., Cossor, B.T.-H., Lanchester.

MAINS UNIT.—With output to suit valves employed (Heberd, R.I., Ekco, Regentone, Clarke's Atlas, Tunewell, Lotus).

THE "P.P." AMPLIFIER

(Continued from previous page.)

There is one small point that wants watching, and that concerns the spacing between the two valves. If you place the valveholders too close together there may not be sufficient room if a pair of big valves are used.

Keeping Out H.F.

Although the amplifier was designed for 2-volt valves, it is quite suitable for 4- or 6-volters, and it is when employing the latter class that the spacing of the holders will have to be watched. Some of the bigger output valves have bulbs of quite large dimensions. The arrangement shown in the diagrams will allow sufficient room for all but the largest valves, however.

By this time no doubt you have noticed the pair of 20,000-ohm resistances, one connected in the grid lead of each valve. These are inserted as a precaution against H.F. currents getting into the amplifier, but in many cases the set will probably work quite well without them. They are really inserted only as a safeguard.

The amplifier is most suitable for connecting after a set using a single stage of L.F. amplification, although it should work quite well after one with two stages provided they are well decoupled and large valves are used in the amplifier. It will certainly work after a plain detector valve, but the output from this under normal circumstances would hardly be enough to load it fully.

About the Valves.

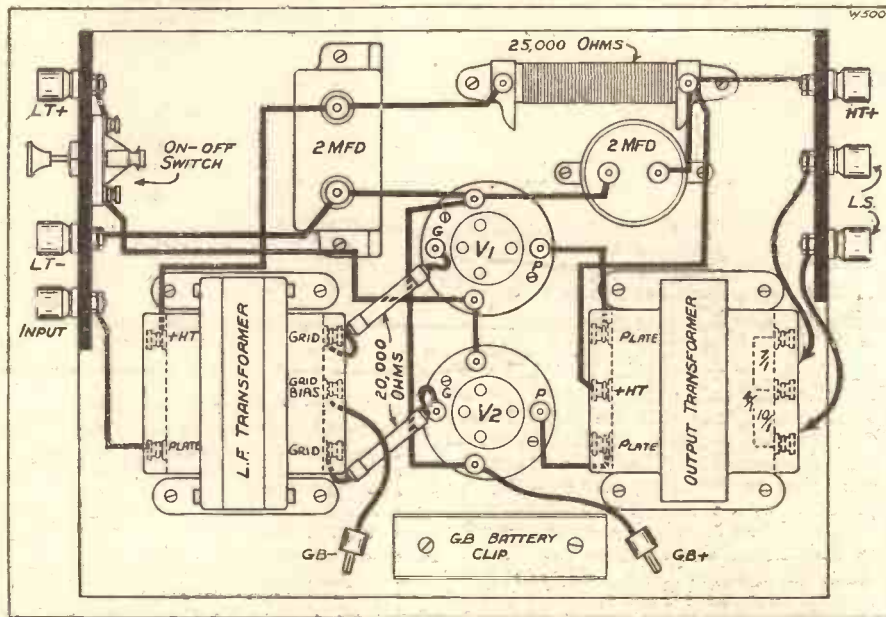
If the amplifier is used following a set with a single stage of L.F., the original power valve could be left in position, but it would be much better to replace it with one of the L.F. type. The reason for this is that when the amplifier is connected the last valve in the set obtains its H.T. from the supply given to the push-pull valves through a 25,000-ohm decoupling resistance.

A power valve takes considerable anode current, and if this were forced through the decoupling resistance there would be a big voltage drop, and the amount left to feed the anode would, in many cases, not be sufficient. An L.F. type valve, however, has a much higher impedance, and therefore requires less current, so fewer volts are lost in the resistance.

An H.T. negative connection is unnecessary for the amplifier, as the return to the negative of the battery is obtained via the common L.T. negative lead.

Regarding the input to the amplifier, this is supplied through the single terminal marked "input." It should be connected to the L.S. terminal on the set that goes to the anode of the last valve. If the set has

SYSTEMATIC LAYOUT SIMPLIFIES WIRING



The layout has been planned so that all the vital wires are as short and direct as possible, as is the case in all "P.W." receivers. There is no doubt that this is one secret of all successful designs.

The grid bias for both valves in the amplifier is obtained from a common tapping, and this is one of the reasons why the valves should be of the same type. It is intended that the amplifier should be worked from the same battery supplies as the set, so one H.T. terminal only has been provided, and this must be plugged into the highest voltage available, taking into consideration the maximum allowed by the manufacturers of the valves.

an output filter incorporated, the lead to the amplifier should be joined direct to the plate terminal of the valveholder concerned.

Matching Up the Speaker.

You have probably noticed that the output transformer provides for three different ratios; this is very convenient, as it enables almost any type of loudspeaker to be matched up to the push-pull valves, which is most important if efficient working and good quality reproduction are desired. The two L.S. terminals on the amplifier are provided with a couple of short, flexible leads, so that the required ratio can be selected at will.

The valves you use will depend on the amount of volume required. An economical arrangement, and one ideal for home use, is to buy a power valve of the type already in the main set, and then use the two for push-pull working in the amplifier, and get one of the L.F. type for the set.

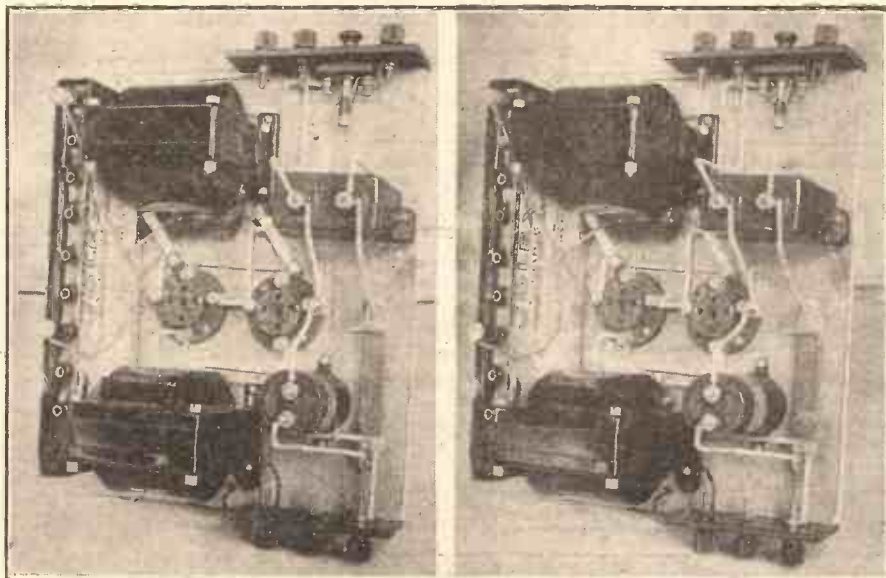
By using a pair of really big valves in the amplifier it is possible to get enough volume to fill a small hall, but this could not very well be done with 2-volters. A pair of 6-volters would have to be used, and then the old trouble of providing sufficient power would arise as valves of this class do not come within the capabilities of dry-battery H.T.

Few Parts Are Required.

As a means of increasing the power of small two- or three-valve sets, the amplifier serves its purpose admirably, and constructors will find it well worth their while to build it. After all, so few parts are required that many readers will be able

(Continued on next page.)

TRY THIS IN YOUR TRUE-VIEWER



The "P.P." amplifier is an ideal subject to try in your true-viewer, for the manner in which it "comes to life" is perfectly amazing.

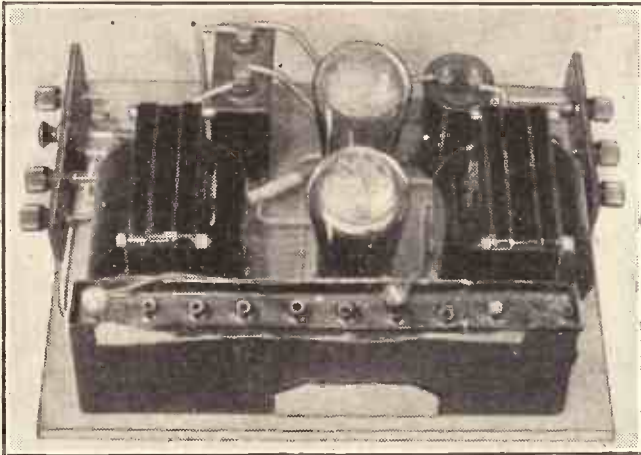
THE "P.P." AMPLIFIER

(Continued from previous page.)

to find most of them in their "junk" boxes. The special push-pull transformers are about the only really vital components in the design.

The reproduction from an amplifier of this class is of the very highest quality, in fact, provided the input is of the best the result from the loudspeaker should be as perfect as modern practice can make it.

ALL READY FOR CONNECTING UP



After finishing the wiring, plug-in a pair of power valves, select a suitable tapping on the grid-bias battery and the amplifier is ready to connect up to your receiver.

Overloading of the output stage in a radio receiver is responsible for a great deal of the distortion of to-day, and the full significance of it is not appreciated until one has heard a good programme through a well-designed amplifier such as this, working well within its limit all the time.

When Switching Off.

A separate on-off switch is provided on the terminal strip that carries the L.T. and input terminals. And don't forget that this has to be switched off as well as the one on the set when closing down for the night, otherwise there will be a run-down accumulator to deal with in the morning.

If it is desired to use a pick-up for record reproduction, this must be connected to the valve before the amplifier, as the output from the pick-up would not be enough to load fully the two push-pull valves. A volume control is also an advantage across the pick-up, preferably mounted on the motor board, for it is nearly always most convenient in this position.

Fine for Record Work.

It is when used for gramophone reproduction that the fine qualities of the amplifier will be realised to the full. The crisp, clear-cut rendering should be a revelation to all lovers of good music.

Push-pull amplifiers have a peculiar tonal value of their own. The effect is not easy to describe in words, but once the crystal-like clarity has been heard, the advantages of this type of circuit will be understood.

The exceptional clearness is no doubt due to the absence of second harmonic distortion in the output; this being another point in favour of the "P.P." arrangement.

Considerable thought should be given to the choice of the push-pull valves if the very best results are desired. Although, as mentioned previously, the most economical scheme is to use the original power valve in the set, together with another similar one in the amplifier, it is generally much better (if funds will allow) to buy a pair of special valves.

SYNCHRONOUS GRAMOPHONE MOTORS

By HANDEL REES.

"THE motor will not change in speed even if you were to place a fifty-six pound weight on the turntable."

That was an interesting bit of fiction that I read somewhere the other day. Presumably, the writer had sufficient confidence in common judgment to know that none of his readers would be likely to try half a hundred weight on any gramophone turntable; but that is not the catch. Bizarre as it may seem, there is an element of truth in the statement.

The A.C. synchronous motor can run only at one definite speed, viz., that which corresponds to the frequency of the supply.

As a matter of fact, it will not run at all until it is first accelerated to that speed, which explains why this type of motor is not self-starting.

Now, this "synchronous speed," as it is called, is absolutely constant. The action of the machine is caused by a rotating magnetic field, but, unlike its contemporary the "induction" motor, the disc, or what-

VALVES FOR THE "P.P." AMPLIFIER

Make	For Last Stage in Set	For Amplifier (2 Required)
Mullard	P.M.1.L.F.	P.M.2, P.M.2A., P.M.202
Cossor	210L.F.	215P, 220P, 220P.A., 230XP.
Mazda	L.210 L.2	P.220, P.220A, P.240
Marconi	L.210	P.2, P.240
Osram	L.210	P.2, P.240
Tungsram	L.210	P.215, P.220, S.P.230
Lissen	L.G.210	P.220, P.X.240
Six-Sixty	L.210	220P., 220P.A., 220S.P., 240S.P.
Eta	210L.F.	B.W.1304, B.W.602, B.W.303
	BY1814, BY1210	

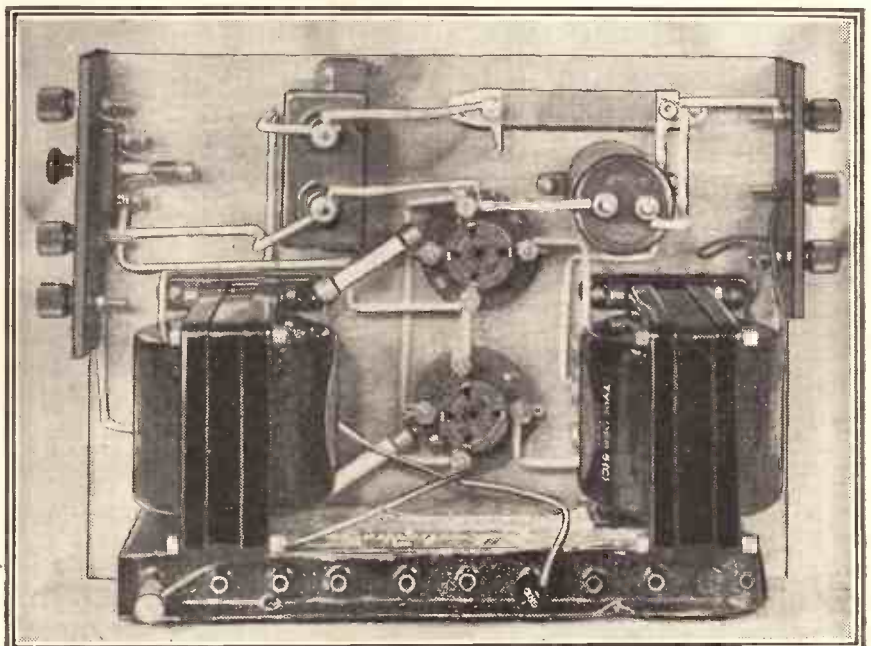
When deciding on the power valves, the amount of volume required should be taken into consideration. All the above are 2-volters, and the types opposite each make are given in ascending power order.

ever forms the moving part, must turn strictly in step with the field.

In that sense, the speed must of necessity be dead constant; but should the load become too heavy, the rotating element would simply be pulled out of step and stop. Obviously, there must be a limit to the work any machine can perform.

Within the limits of its load capacity, the synchronous motor is an absolutely constant speed machine, and that applies to any load imposed by gramophone recording.

HOW THE FINISHED AMPLIFIER SHOULD LOOK



You will find this photograph very useful when wiring up, for it is a photographic representation of the wiring diagram. Remember, the two valves that will occupy the valveholders must be of the same make and type.



WHAT is the ideal way of obtaining revenue for the B.B.C.? Is it, as at present, by fixing a yearly licence of 10s., or should the B.B.C. raise money by advertising, or even hand its organisation over to some big firm which would run it as a purely commercial enterprise?

Most people will probably agree that our present scheme is the most satisfactory, but it is as well to bear in mind that there are dozens of ways and means of making a broadcasting system pay; and it is significant that few countries work on anything quite like the system which has been adopted in Great Britain. Many, it appears, raise their money by way of licences.

How They Manage Abroad.

The listener in this country who grumbles when once a year he has to find ten shillings for his licence and then grouches again because he is kept standing about at the Post Office may well feel envious of listeners in the U.S.A. and France, who do not need to bother about any sort of wireless licence.

Perhaps he would not mind quite so much if the 10s. were collected in instalments by the postman as is done in Germany. In any case, it is worth our while to look around the world and see how they manage in other countries.

We all know the high quality of Danish wireless programmes. Who pays for them? The listener, who is charged 11s. a year for his licence. No other means of raising money are used.

Paying By Valve-Power!

Czechoslovakian broadcasting is run in the same way, listeners paying about 9d. per month, of which 80 per cent goes to the broadcasting organisation.

Belgium, where 10 per cent of the licence fee is retained by the State, has introduced a state of equity which may appeal to many.

Listeners are charged:

11s. per year if they listen on a crystal set.

£1 13s. per year if they use a valve set.

You might ask: Why not let British listeners pay a licence according to the quality of their sets, say 2s. per valve?

Austria has a somewhat complicated system compared with our own. She charges:

FROM A SPECIAL CORRESPONDENT.

Should advertising be introduced by the B.B.C. to pay expenses, instead of charging listeners a licence fee? That is the method employed in America, and below are some interesting facts about radio revenue in other countries.

15s. 6d. per year for private subscribers, payable by instalments of 2s. at intervals of not more than a month;

13s. per month for dealers in, and manufacturers of, wireless apparatus in Vienna and Graz;

7s. 6d. per month for the same in places

WHAT THEY DO IN GERMANY



German listeners pay a licence fee, as we do, and in general their system is very similar to our own. This is reflected in the German programmes, which at this Berlin café are relayed for open-air dancing.

of more than 20,000 inhabitants, with the exception of Vienna and Graz;

3s. 7d. per month for the same in all other places in Austria;

2s. 5d. per month for a receiving apparatus used in a public establishment;

1s. 2d. per month for every loudspeaker attached to such apparatus;

1s. 2d. per month for every five head-

phones attached to such apparatus. These fees are collected by the Austrian Postal Department, and 90 per cent is handed to the Austrian broadcasting organisation, which supports the charges of the construction and technical operation of its transmitters.

How long the B.B.C. would survive if it had to rely on voluntary subscriptions from listeners is difficult to speculate upon. Yet this is the method adopted in Holland, where the various broadcasting concerns, with one exception, are of political or of religious foundation.

Depend On Charity.

Some of them receive subsidies from parent organisations, but those who depend entirely on the charity of their listeners do equally as well and maintain a high quality of programmes.

Hungary is another country which runs its broadcasting entirely out of licence fees—in this case 1s. 10d. per month. A similar arrangement is adopted in Sweden, where they charge 11s. per year.

Italian broadcasting is supported in four ways:

(1) The licence fees of listeners (12s.).

(2) A tax on the sales of receiving apparatus.

(3) Taxes on municipalities.

(4) The broadcasting of advertisements.

Five shillings a month is the licence fee paid in Japan. The Japanese Broadcasting Corporation supplements its income (as does the B.B.C.) by the sale of periodicals. The powerful transmission which you hear from Warsaw is paid for from two sources: licence fees (15s. a month) and the broadcasting of advertisements; the Post Office of Poland retaining 15 per cent of the licence revenue.

Turkey raises revenue for broadcasting mainly by a tax on imported receiving sets and by advertisement programmes. There is also, however, an annual licence fee of £1 6s.

How Far Away?

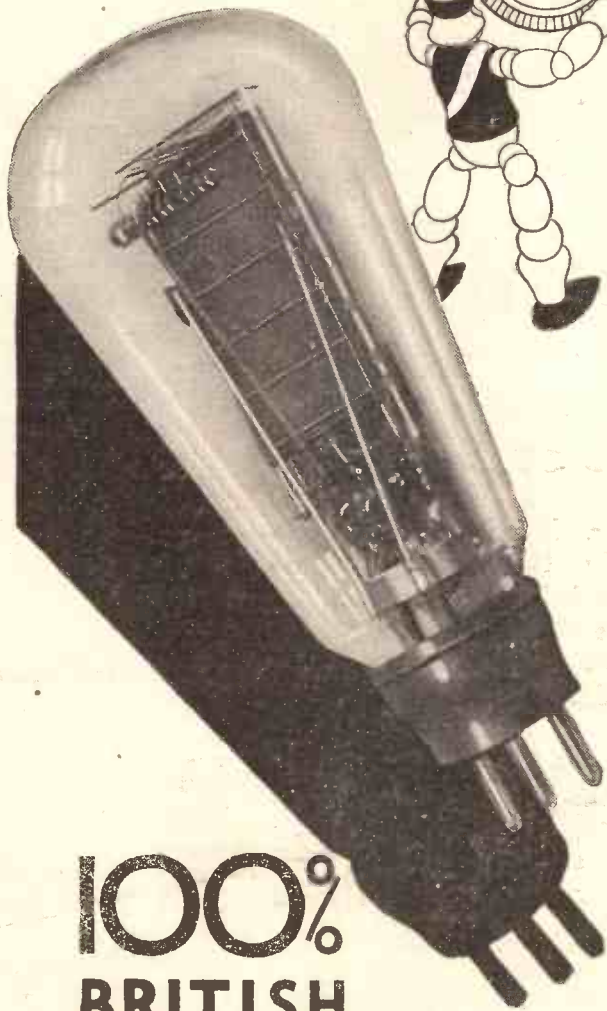
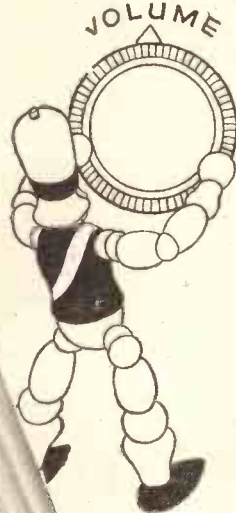
Australian listeners pay according to the distance they live from the nearest broadcasting station. Thus the annual fee is 24s. for those residing within 250 miles of a station or 17s. 6d. for those living between 250 and 400 miles.

Another country to grade the licence fee according to the proximity of the listener to the transmitter is South Africa. Those nearest pay 35s. a year and the most distant only 2s. 6d.

Raising money for broadcasting in any part of the world seems really to be quite a simple matter, and the various means differ only in method, for in the long run the listener pays. Either he pays by direct taxation in the form of a licence fee, or indirect taxation in the shape of tariffs on equipment; or else, as in Holland, he pays voluntarily.

FACTS YOU SHOULD KNOW ... ABOUT THE MAZDA RANGE OF POWER OUTPUT VALVES

LOOK
FOR "EDDY"
IN YOUR
DEALER'S
WINDOW



A good receiver, whether battery or mains operated, can be made or marred by the power valve. Each type of Mazda Power valve has been designed to give its most efficient performance under specific conditions. Here is a guide to the selection of the correct Mazda Mains Power Valve for your particular purpose.

THE AC/P—a low consumption power valve for operating balanced armature speakers. It is sensitive to comparatively small inputs, and will give good results on anode voltages as low as 150.

THE AC/P1 will handle a bigger signal input and will satisfactorily operate a moving coil speaker. It requires 200 volts H.T.

THE PP5/400 is a heavy power output valve capable of fully loading a large moving coil speaker. The anode current at 400 volts is 60m/a with 30 volts bias.

For Battery operated receivers there are the following:

P220 and P220A, both capable of giving ample volume with a reasonable input. The former valve is particularly recommended where economy of anode current is a consideration.

Full details of these and other useful Mazda types will be found in the Mazda catalogue, sent FREE on request.

Mazda valves are fitted by all the leading receiver manufacturers. All good radio dealers stock them.

The amazing

MAZDA THE BRITISH VALVES

100%
BRITISH

Designed by British Engineers

The Edison Swan Electric Co. Ltd

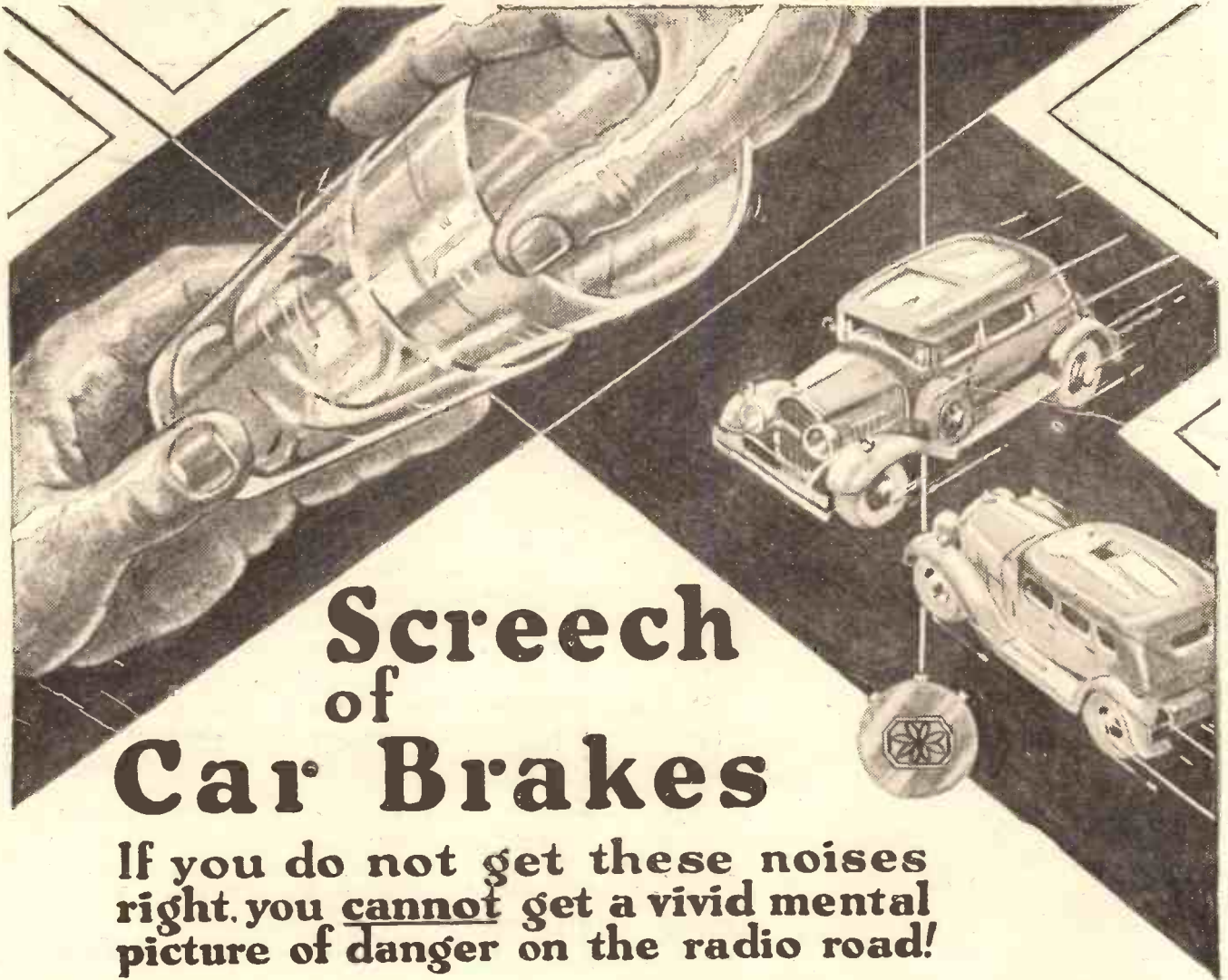


155 Charing Cross Rd London W.C.2

Mazda Radio Valves are manufactured in Great Britain for

The British Thomson-Houston Co. Ltd., London and Rugby.

V.169



Screech of Car Brakes

If you do not get these noises right, you cannot get a vivid mental picture of danger on the radio road!

Brakes hard on—disaster missed by a hairsbreadth! The broadcast sounds, produced by simply twisting two glass tumblers together, are amazingly realistic. Thousands of experiments have perfected the technique of the Effects Studio and put vivid realism into radio drama . . . and you, by putting the pure current of a Lissen High Tension Battery in your set can retain this realism so that your ear hears the sounds perfectly, your mind's-eye cannot fail to see the picture. There is a process used exclusively in the Lissen Battery which produces power of remarkable purity; power so sustained that over prolonged periods of time it remains steady, noiseless and abundant always. Every radio dealer sells the Lissen High Tension Battery; ask for it firmly by name.

HOW
STUDIO
SOUNDS
ARE PRODUCED

LISSEN H.T. BATTERY

lasts longest and provides a pure high tension current that will give stage realism to your radio drama !

CAPT. ECKERSLEY'S QUERY CORNER



Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

POLARIZATION—FEED-BACK AND VALVE CAPACITY—MAN-MADE STATIC—POOR INSULATION.

Over-running Dry Batteries.

S. P. (Salisbury).—"I have been told that dry batteries are unsuitable for supplying L.T. to a receiver owing to the rapid 'polarization' of the cell. What does the term 'polarization' mean?"

When a battery gives current it does so by a chemical process involved with zinc, copper and acid. As current flows there is a tendency for the chemical processes to produce a voltage in the opposite direction to the wanted voltage producing the current. Actually, gas forms on the battery poles.

This is called the polarization of the cell and de-polarizing compounds are included in the muck they shove inside the things to stop the effect being too severe. But a dry battery polarizes worse than an accumulator. So a dry battery when it's first called upon to supply current may give 1.3 volts but polarization fighting depolarization processes ends up in a slight gain for the former, and the total resulting battery voltage may soon fall to 1.2 volts.

This does not matter for H.T. supply; it does for L.T. supply. Incidentally, most valve filaments take more current than ordinary cells will supply

Loss of Efficiency in S.G.

H. R. K. (Pitsea).—"Having found that the screen-grid valve in the H.F. stage of my receiver was losing its efficiency after about two years' use, I decided to replace this with a later and more efficient type. Upon doing so, I found that the receiver would not operate normally, severe instability being evident.

"I was, fortunately, able to try an unused valve of the original type, and found that with this results were quite satisfactory.

"As the impedance and interelectrode capacity of the more efficient valve are the same as the original type (the only difference being that the amplification factor and mutual conductance of the

Capt. P. P. Eckersley—for many years Chief Engineer of the B.B.C. and now Chief Radio Consultant to "P.W."—is undoubtedly one of the world's foremost radio engineers. In

"ECKERSLEY'S QUERY HANDBOOK"

you have the benefit in your own home of Capt. Eckersley's unique knowledge and authoritative writings on practically every branch of radio reception.

GIVEN FREE WITH YOUR
"P.W." TO-DAY!

new type are higher), I cannot see why this instability should have been caused. I should be pleased if you could advise me on this point."

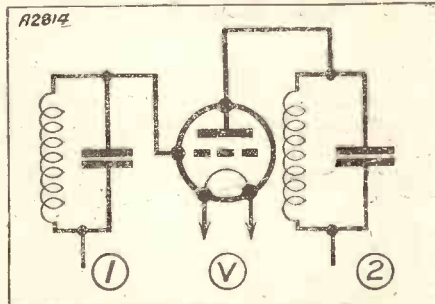
Consider "the valve" in general. Look at the diagram. Circuit No. 1 connects to the grid filament-circuit of the valve; circuit No. 2 is in the anode circuit.

If circuit No. 1 couples in any way to circuit No. 2, then some energy is fed back from No. 2 to No. 1, and the system is regenerative; it tends to oscillate, and it may actually do so.

But if the valve has a low magnification, then, with a given coupling, obviously less energy is fed back from No. 2 to No. 1.

As the valve magnification increases, so the feed-back or tendency to make the circuits oscillate increases. Also, whatever the valve magnification, the more physical

CAPACITY THE CAUSE



In his reply to H. R. K. (Pitsea), our popular Radio Consultant explains how valve capacity causes instability.

coupling between circuits, the more the valve tends to oscillate.

In fact, the tendency to oscillate is determined by two factors, (a) the physical coupling between the circuits, (b) the valve magnification; so that by substituting the new valve with a higher magnification for the old, you get a greater tendency for the circuits to oscillate.

To stop this tendency you must reduce the inter-circuit coupling. This can be done by perfecting the screening. But, remember, even though the circuits are perfectly screened, there is, nevertheless, some coupling in the valve, even if that valve is of the screened-grid type.

The screen has to have holes in it, and there is therefore a residual capacity.

Absolute stability is only obtainable by obtaining zero coupling, and this is only achieved by neutrodyne connections.

But for practical purposes it is usually possible to use valves and circuits which

have so small a coupling as to produce stability.

Write to the B.B.C.

S. T. R. (Holloway).—"My friends and myself are experiencing interference between 1,500 and 2,000 metres, in the form of an annoying buzz, which completely spoils the week-end programmes from Radio-Paris, since the interference is within such a narrow waveband. Can you suggest a cure?"

Quite honestly, I cannot even guess at the trouble without a personal investigation, or without answers to a written questionnaire.

My best advice to you is to write to the B.B.C., who will send you a questionnaire, who will know about your locality from previous and other records, and who will, I am sure, be able to help you to find what's the matter. Don't tell the B.B.C. you listen to Radio-Paris on Sundays, though!

Works Without a Grid Leak.

G. K. (Reading).—"I find that I can remove the grid leak associated with the detector valve of my receiver without stopping it working. Is this in order?"

Yes and no! A "leak" is a high resistance. But a "leak" has to be held in something or mounted on something.

These somethings must be made of something, and that something is supposed to be an insulator or have an infinite resistance. When it's cheap or made of one of the many "ites" which delight the component manufacturer, it pretends it's an insulator and is actually a leak.

Even valveholders have been known to—well, let's not say conduct, but shall we say leak! So your grid leak is a leak of insulation. Why not? Because it ought to be a fixed value, and so you ought to mount your real leak on a good holder—if you can.

**SPECIFIED
FOR THE**

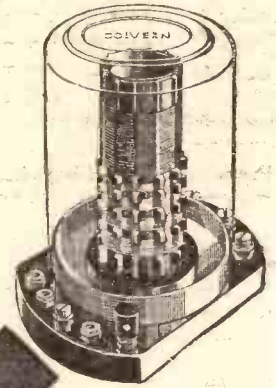
"APEX"

TWO COLVERN T.D. COILS

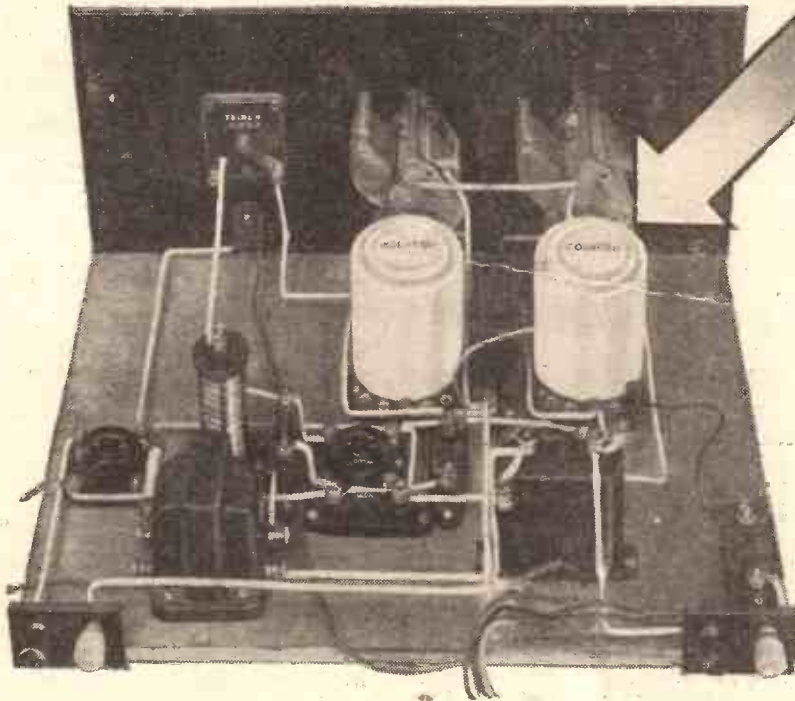
The Colvern T.D. Coil is completely screened and incorporates tapped aerial coupling and reaction. Four alternative aerial tapplings are arranged as sockets with a wander plug.

The first two tapplings give aerial couplings similar to those normally employed but with greatly increased selectivity.

Numbers 4 and 5 give a high degree of selectivity with weak aerial coupling suitable for use in a swamp area. There is no break through on the long wave-band from B.B.C. Stations.



**SUPER
SELECTIVITY
ON BOTH
WAVE-BANDS**



Specified for the
"APEX" RECEIVER
COLVERN Type T.D. COILS
one pair, 17/-
One 30,000 ohm
STRIP-RESISTANCE
2/3

Our 1933 Booklet Radio List No. 10 is now available and free on request.

COLVERN LIMITED

MAWNEYS ROAD

ROMFORD, ESSEX.



The GERMAN RADIO SHOW

ALL the Berlin shows previous to 1932 were marked by one prominent characteristic—they were larger than the exhibition of the year before. This year the organisers told the world that the show was the same size as last year. This is correct in so much as that the exhibition as a whole is the same size, but the radio set part of it is very slightly smaller.

A Suggested Conspiracy.

German radio manufacturers complain of a conspiracy of neighbouring States to curtail German radio imports. The curious manner in which France has treated the German contingent in comparison to that of Holland, the British custom duties, the fall in the value of the Scandinavian money, all these factors go to make an impending crisis in the hitherto prosperous radio industry seem probable. Exports to Britain are down by 85 per cent, exports to other countries by one half.

I even heard complaints that the British radio manufacturers were lacking in international courtesy for fixing the date of the London show on the traditional date for the opening of the Berlin show, and for not answering letters from the German Association suggesting some way out of the matter. I have not heard what the R.M.A. has to say on the matter!

The German Show consisted of two large sections—one devoted to radio receivers and one devoted to television, electrical music, anti-interference, and transmitter developments.

Entirely New Sets.

All manufacturers, or nearly all, have discarded last year's models, and are offering entirely new sets to the public. The reason is easy to find. High-power stations are cropping up all over Europe, and they have put before the listener an entirely different listening situation.

Every set, even the least expensive, has become a receiver capable of roping in a number of distant stations, and the local or Regional receiver of previous years seems to have vanished.

Super-hets. are to the fore. Most of them equipped with automatic volume control, with a tone-corrector, and combined with moving-coil speakers.

Absolute one-knob tuning is now the order of the day owing to even greater precision in the making of ganged condensers.

Some illuminative details of the leading lines at the great Exhibition recently held in Berlin.

I saw one super-het. which permitted damping of the sensitivity at will. This is attained by setting the point at which the automatic volume control is to start off. By this means stations close to the receiver can be received without having to mix them up with all the static coming from farther afield.

Three-Band Super-Het.

Schaub was showing a super-het. for all three wave-bands: short-wave, medium-wave, and long-wave. This, Germany's cheapest super-het. costs just under £14 without valves.

After super-hets. and four-valve three-circuit receivers, come the three-valve two-tuned-circuit receivers, and then the one-circuit two-valvers. These two latter still use reaction, and are remarkably good at getting a number of distant stations with

"IT MAKES SUCH A DIN!"



Here is an expert in tracking interference—one of many employed by the German authorities to visit listeners' homes.

good selectivity. Here it seemingly was not possible to further lower the prices.

A visitor to the Berlin show remarked to me at the more or less total absence of the old type of tuning dial. The best sets have quite new types of dials.

Telefunken has two vertical rows of frequencies, against which it is possible to stick a small bit of celluloid carrying the name of the station which will be heard when that frequency is tuned in. When turning the tuning knob a shadow is moved up and down the illuminated columns exactly marking the desired station.

A.E.G. have a similar development, only here the columns are not quite so high, and a stroke of light projected from the back on to the transparent screen with station names and frequency markings indicate the station tuned in. Other firms have followed suit by nearly all using large dials crowded with station names.

Only Two Portable Firms.

Had they shown the same originality as the firms just mentioned they probably would not have produced such confusing dials!

I ought not to forget to say that I saw only two makes of portables, and they are the same as they were two years ago when they came out. There seems to be no market for a portable in Germany.

One firm had followed the American lead, and was showing a five-valve super-het. for use on the dashboard of a car. The firm is Blue Spot, so no doubt the sister firms throughout Europe will shortly be announcing the same type of set.

Valves of all types for A.C., and the 20-volt type for D.C., are there. Only prices have been reduced a further ten to twenty per cent. The only firms making valves in Germany are Telefunken and Valco, this latter under licence from Telefunken.

Fresh Type of Speaker.

Neufeldt and Kuhnke of Kiel, a well-known firm, have developed an interesting new type of loudspeaker which also comes over from America. It uses two salt crystals that create strong mechanical vibrations when speech and music modulation is put across them. The loudspeaker is of good quality and has a very high efficiency factor.

Moving-coil speakers are even cheaper than some types of electro-magnetic speakers now in Germany.

(Continued on page 206.)

THE MOST SENSATIONAL

The TELSEN

SUPER-SELECTIVE!

HYPER-SENSITIVE!

ULTRA-MODERN!

Build it with the aid of the full size 1/- Blue Print given FREE with the New Telsen Radiomag!

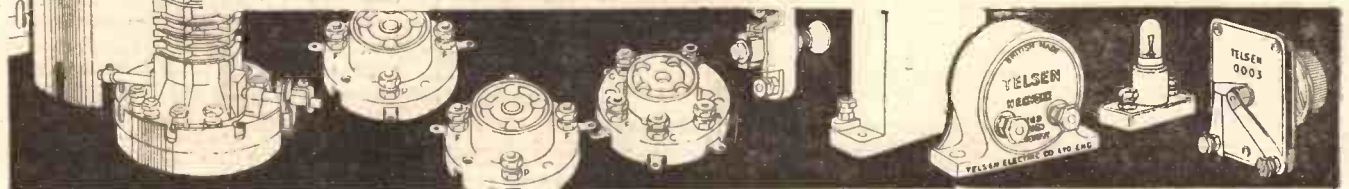
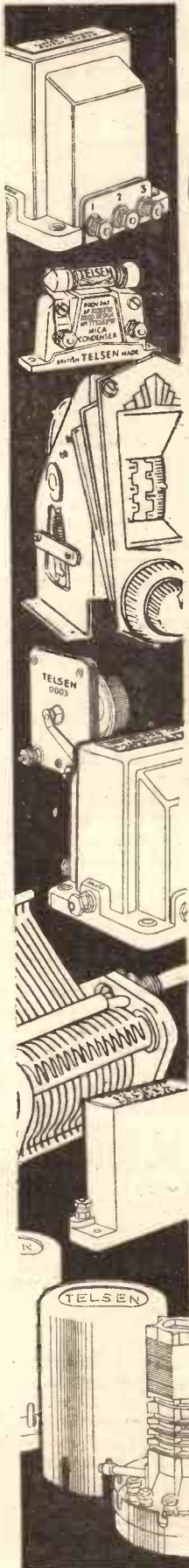


Not only has it never before been possible for the home constructor to build so powerful a 3-valve receiver with standard easy-to-buy components—not only is the actual construction almost child's play—but the brilliant results obtained, coupled with the delightful simplicity of the single-knob tuning, operating a scale marked in actual wavelengths, enable even the absolute beginner to obtain a large number of stations at full volume, and with the utmost tonal realism, the number naturally increasing still further with experience!

Meeting every requirement of the expert, the Telsen Jupiter S.G.3 incorporates Ganged Condensers, Ganged Coils, Tuning Dial calibrated in wavelengths, and Matched Output, the circuit providing for absolute control of selectivity, with entire prevention of L.F. oscillation. The revolutionary 10-1 Coupling Unit specified gives a stage gain on the L.F. side equal to that of a two-stage amplifier, this ensuring (in conjunction with the low-loss coils) an overall amplification of a magnitude never hitherto approached in a three-valve battery-operated receiver. But the Jupiter S.G.3 is *not* a "kit" set which you have to buy complete, and it is therefore quite possible that amongst the components specified are some which you already have, and will therefore not need to buy.

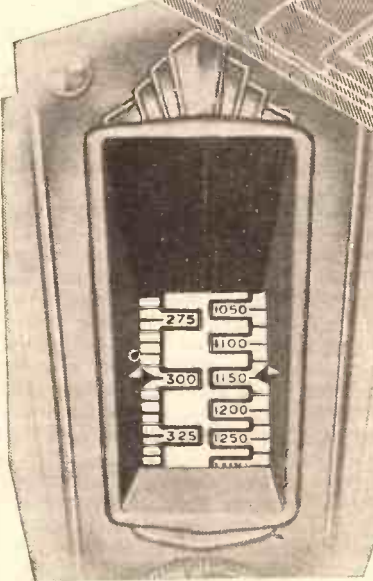
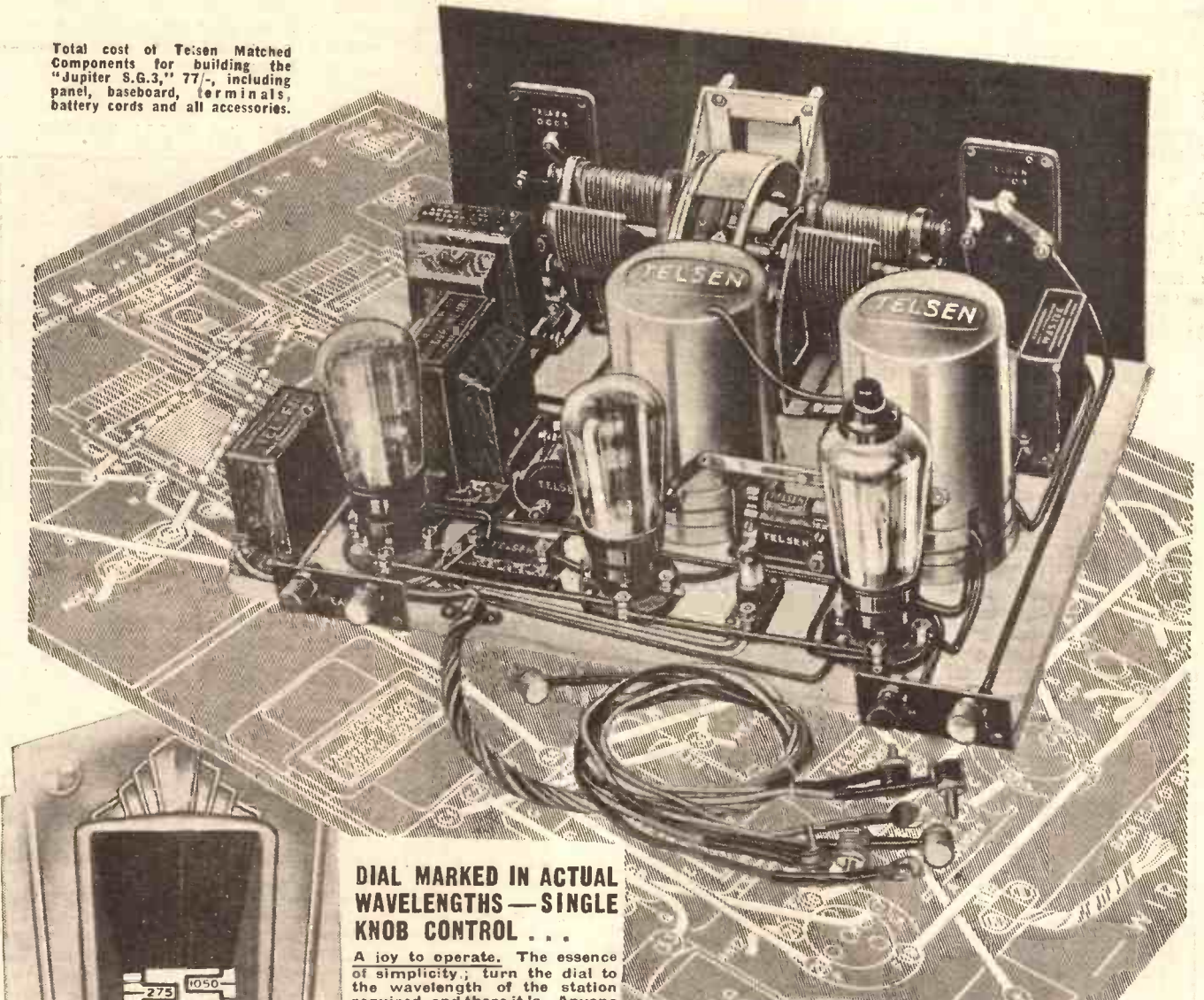
Free full-size 1/- Blue Prints of this and other brilliant Telsen circuits, together with full constructional details, are contained in the new and enlarged edition of the Telsen Radiomag, price 6d. from all radio dealers and newsagents. Get your copy now!

Make sure you get your **TELSEN RADIOMAG No. 3.**



SET OF THE SEASON / ... JUPITER S.G.3

Total cost of Telsens Matched Components for building the "Jupiter S.G.3," 77/-, including panel, baseboard, terminals, battery cords and all accessories.



This handsome Drum Drive escutcheon adds dignity and simplicity of operation to your "Jupiter S.G.3."

DIAL MARKED IN ACTUAL WAVELENGTHS — SINGLE KNOB CONTROL . . .

A joy to operate. The essence of simplicity; turn the dial to the wavelength of the station required, and there it is. Anyone can obtain a large number of stations. But so clever is the design that, as experience is gained, the large catch of the beginner is increased day by day.

Special Separator Control. A unique device of extreme value for adjusting the degree of selectivity when receiving both local and distant stations with the unusual advantage that neither the tuning nor the fidelity of reproduction is affected. This control is also a valuable adjunct for varying the volume from maximum to a whisper even on the local stations.

TELSEN

RADIO COMPONENTS

THE GERMAN RADIO SHOW

(Continued from page 203.)

Numbers of stands at Berlin showed intermediate frequency band-pass filters. Electrolytic condensers, with liquids and with jelly, were well represented; even crystal receivers have been further improved so that the latest is a pair of headphones into one of which the actual receiver has been built, the other acting as headphone.

The Heinrich Hertz Institute of Berlin had a special tent as auditorium, seating three hundred people for the special show of electric-music instruments. Of these the Trautonium is the most interesting from a technical and from a musical point of view.

Does Anything You Wish.

The Trautonium can do anything you wish. You can beat a drum with it (not actually, but the sound from the loudspeaker is the same) or you can play trumpet or piccolo flute, whatever you want. You play all this on a wire on which about three to four octaves can be covered.

If you want to go up higher or lower you only need to turn a switch, and if you want to change the character of the sound you turn the knob of a condenser, four of which are provided. By pressing the wire you short-circuit part of it, thus altering its resistance to a current (of 4 volts) which passes through.

The wire resistance is in circuit with the grid of a Thyatron, a neon tube of a special type. The Thyatron lies across a battery shunted by a condenser.

The higher the grid voltage the longer it takes to load the condenser to the voltage required to pass through the Thyatron, and thus the time interval between dis-

charges is changed, and, with it, the fundamental frequency of the note, as the sequence of Thyatron discharges form the fundamental frequency.

This frequency is specially rich in harmonics, and the condensers serve to alter the number of harmonics passed, thus influencing the character of the sound. Volume is controlled by a foot pedal and by the amount of pressure on the wire.

A small knob is placed under the metal electrode which is pressed down if you press hard on the wire, and thus on the metal rod underlying it.

Full-Fledged Musical Instrument.

Mr. Sala, the best Trautonium player in Germany, told me that in spite of the rather technical aspect of the Trautonium it was a full-fledged musical instrument now, and certainly the concert Trautonium accompanied by Neo-Bechstein, proved it. I hear that the Trautonium will shortly be used regularly at the Ufa Palast am Zoo in Berlin for Sunday morning concerts.

The Neo-Bechstein is a small grand piano with loosely strung strings. Instead of the usual sounding-board, small electro-magnets pick up the vibrations from the strings and transform them into electrical currents, these are amplified and made audible by a loudspeaker.

A radio receiver is combined with the grand piano, so is a gramophone turntable and pick-up mounted in the top of the loudspeaker cabinet which stands on the floor near the "grand."

A smaller type of Theremin instrument was on view, and so were another type of electrical piano, and an electric cello and violin, where the sounding-board was removed and a small electro-magnet substituted.

The Theremin, of course, is well known to readers. This smaller set contained a small oscillator circuit, the set requiring a normal radio receiver and loud-speaker to be played.

Difficult to Play.

The Trautonium is also supplied without L.F. amplifier and L.S., if so desired. I watched the playing on the Theremin with great interest, but must say that only very few will be able to produce really good music with it. And as for the electric cello and violin—well, why not go the whole hog and play the Trautonium?

The second of the "side-shows," though it occupied nearly as much space as the

actual radio set exhibition, was organised by the German Post Office and the R.R.G. The Post Office showed television and models of the new Berlin station and the new types of aerial to be used at Leipzig, together with life-size S.W. transmitters for microphone link during O.B.'s. The R.R.G. had two films on view in a special theatre seating 200 persons, and another special auditorium with about as many seats was reserved for experimental lectures on man-made interference. Then there was a special section devoted to works by artists and sculptors who had chosen radio broadcasting as a theme for their paintings and bronzes, etc., and a small room was reserved for those persons desirous of listening to the voices of famous people who had broadcast from the various German stations.

YOU CAN TUNE AS YOU DRIVE



The super-het. on the dashboard (top left) is a special model for cars and motor-boats.

I listened to the King opening the naval disarmament conference, to Bernard Shaw, to Edgar Wallace, to Sinclair Lewis, to Herr von Papen and von Schleicher. (Curious to say, or, rather, not at all curious, no record could be heard of Brüning, nor was the famous Reichstag speech record on "hear.")

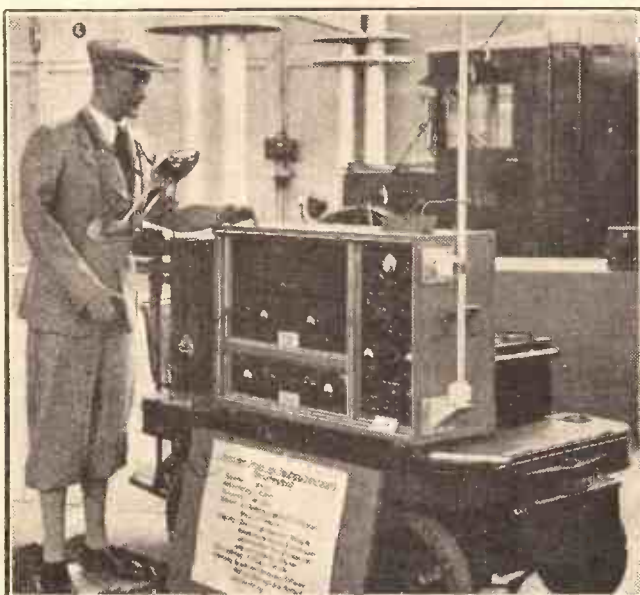
The Television Exhibits.

Television occupied half of a vast hall this year, as the gallery on which it was shown last year has been done away with this year.

Tekade were showing mirror screw receivers also coupled to a super-het. for ultra-short waves. The German Fernseh A.-G. had by far the largest stand. They were showing Nipkow disk receivers (did you know that the inventor Nipkow lives in Berlin and is just over 70?) and mirror-wheel receiver as well as the new film transmitter which takes all pictures to be televised on film, develops and fixes these in less than fifteen seconds, and then scans them in the usual manner.

They were also showing a transmitter for head pictures, and, of course, they supplied the transmitter to the R.R.G. for the test transmissions with the new Berlin ultra-short-wave transmitter. All transmitters and receivers worked with the new Post Office standard of 90 lines and 25 pictures a second. Definition was very good, and I must say that although we are "not there yet," we soon will be!

PERAMBULATING RADIO



This exhibit, which attracted a great deal of interest at the Berlin Show, is a movable transmitter complete with portable microphone and aerial, which is used chiefly for reporting purposes.

He has built it
- SO CAN!
YOU!



from the
**GREAT LISSEN
FREE CHART**

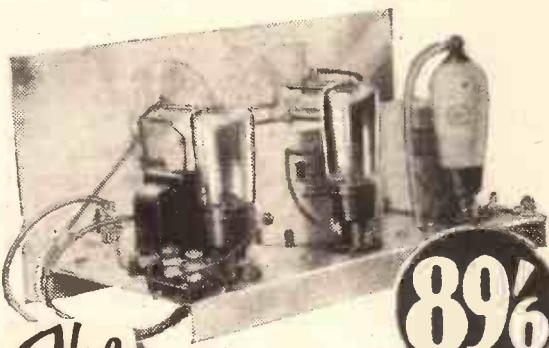


The **ONLY**
receiver you can
build yourself
employing **Metallised
Screen Grid Valve,
High Mu Detector and
Economy Power Pentode**

There never has been the equal of this set within the range of the home constructor—this new Lissen Skyscraper is the only one on the market that you can build yourself, employing Metallised Screened Grid, High-Mu Detector and Economy Power Pentode Valves. No factory—however well-equipped—can build a better receiver. No manufacturer, however large, can produce a receiver whose results will surpass those you will get from the Lissen Skyscraper you build yourself. It is the *only* battery set that can deliver such power—yet the H.T. current consumption is far less than that of the average commercially-designed 3-valve set.

Yet the Lissen Skyscraper is made simple for you to build. Elaborate care has been taken to ensure your success by giving—in the Skyscraper Constructional Chart—such detailed instructions and such profuse illustrations that everybody, with no technical knowledge or skill at all, can build it quickly and with complete certainty of success.

You buy the Lissen Skyscraper Kit complete with valves—a Lissen Metallised S.G., a High-Mu Detector, and a Lissen Economy Power Pentode Valve—and the price is only 89/6. Or you can buy the Lissen Walnut Console Skyscraper Cabinet and Loudspeaker combined as illustrated. It holds all batteries, and accumulator and loudspeaker as well. It makes everything self-contained. A special Pentode Matched Balanced-armature Loudspeaker of great power is supplied with the cabinet and the price of the Skyscraper Kit complete with valves and this cabinet and loudspeaker is only £6 5s.



89/6

KIT INCLUDING METALLISED
S.G. VALVE HIGH MU DETECTOR
& ECONOMY POWER PENTODE

POST THIS COUPON

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Please send me **FREE** copy of your
1 - Skyscraper Chart.

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EMPIRE BROADCASTING

FROM A SPECIAL CORRESPONDENT.

Despite rumours of all sorts of troubles, it seems pretty certain that the B.B.C.'s Empire Short-Wave Station will conduct tests before this year is out and will be giving a regular service early next year. This and a danger-signal from Madrid form the subject of our contributor's remarks.

RUMOURS that the B.B.C.'s new Empire broadcasting scheme was not working out satisfactorily, and that, in particular, troubles over copyrights, etc., seemed likely to jeopardise the success of the new service, appear to have had some foundation in fact. But as is usual where Dame Rumour is concerned, the troubles were exaggerated, for the latest news to hand seems to indicate that if all has not gone as smoothly as the B.B.C. might have wished, the new Empire service will be given in due course, and more or less up to the high standard planned by the B.B.C. organisers.

Work Progressing Rapidly.

Work on the new short-wave station at Daventry is progressing rapidly, and test transmissions are fairly certain to be made before the end of the year. If they prove satisfactory, the B.B.C. will start a full service for the Dominions and Colonies before the summer of 1933 arrives.

A considerable amount of experience in the radiation of Empire programmes has been gained from the working of 5 G S W at Chelmsford during the past few years, but the B.B.C. is now endeavouring to collect more detailed information which will enable them to provide a 100 per cent service. The testing period will probably be prolonged, and the Empire programme policy will be decided after consideration of the reports that are expected to come in from all parts of the world.

Divided into Zones.

In the early stages of the service the B.B.C. will try to provide a programme of about two hours' duration between the hours of 6 p.m. and midnight, local time. For this plan the Empire has been divided up into zones, and three distinct programmes will be broadcast from the short-wave station on different wavelengths at different times of the day. Apart from the news bulletins, the times of which must be constant, programmes will be arranged in such a manner that recurring classes of material will be given late and early within the various programme periods. By this means it is hoped to give distant listeners a variation of fare at any given local time.

The type of programme to be broadcast will be primarily decided by the reports received during the testing period. Of course, there is a great difference between the reception of programmes from near-by transmitters working on broadcasting wavebands and that from distant short-wave

transmitters. The latter is subject to fading, atmospherics, etc., and these factors will have to be taken into consideration.

The B.B.C. is asking for reports and expressions of opinion, and it is hoped eventually to devise a service that will satisfy listeners overseas and act as a bond between the different parts of the Empire.

The fact that a B.B.C. delegate at the Madrid Conference had the nerve to suggest that broadcasting stations should reduce power to a degree compatible with giving good national service only, did not receive half the attention it merited (or demerited) in the daily press. With the exception of that ever progressive and "live" newspaper, the "Daily Telegraph," the "Observer," and one or two provincial papers, the press ignored the danger signal. For danger signal it was—and we were glad to notice the caustic and well-earned criticism published in the "Observer" by Capt. E. H. Robinson.

FROM MANCHURIA TO AMERICA



Inter-continental broadcasts by the aid of short waves, like Empire Broadcasting, can do much to ensure world peace by bringing the peoples of different countries "closer together." Here we see a Japanese General during a broadcast from Manchuria for the benefit of American listeners in the United States.

"It has been well known for many years," wrote Capt. Robinson, "that there is a mild state of war existing within the British Broadcasting Corporation.

"The engineers, jealous for the reputation of their stations as regards quality, would have all listeners confine themselves to their local transmitter. This may be overstating the case, but it indicates the frame of mind of those responsible for transmission.

"On the other hand, the Corporation has adopted as its motto, 'Nation shall speak peace unto Nation,' and its publicity department, by the weekly issue of world-wide programmes, encourages British listeners to seek their entertainment among foreign stations."

A Warning to the B.B.C.

The writer continued by pointing out that such a suggestion, as was made by the B.B.C. delegate at Madrid, renders the B.B.C.'s motto illogical, and that, to be consistent, the B.B.C. should give up publication of "World Radio." We hope that will not be necessary, but we warn the Broadcasting House pundits that any scheme they may concoct which is based on the idea of depriving the listener of reasonable chances of reception of foreign stations will meet with the most powerful opposition. If necessary, "P.W." would set about the organisation of a campaign which, we flatter ourselves, would end in the ignominious rout of all who have the effrontery to assume that B.B.C. programmes alone are all that British listeners are entitled to.

TECHNICAL TIPS.

Read through the following items for they may enable you to get better reception.

One of the best aerials to use is 7/22 copper wire, run straight from the aerial insulator to the aerial terminal on the set, without a break at the lead-in tube.

When fitting an earthing switch do not break the wire unnecessarily at the switch, but arrange that it "calls" at the contact and continues on its way unbroken.

You must have a good connection between your earth wire and the "earth," whether this be buried plate or water-pipe, if reception is to be good.

When a valve loses its emission through age or misuse, it is unable to provide sufficient current even though the filament is unbroken and all voltages are O.K.

DOUBLY USEFUL.

One of the great advantages of having a milliammeter is that it enables a check to be kept on valve emission as well as on eaky insulation.

Rusty-looking wires screwed under dirty or greasy terminals are a common cause of poor reception.

Don't forget to try the detector's and the S.G.'s screen H.T. plugs in different tappings of the H.T.B. or mains unit, as often there is all the difference in the world to distant reception after moving from, say, 60 to 48 volts in the one case, and from 66 to 75 in the other.

If your reaction is a bit tricky to handle, try using a large dial—such as an old tuning dial for it, instead of a small one. It makes no end of difference to ease of operation.

AN INSTANT RESPONSE!

FERRANTI

POPULAR WIRELESS

"APEX"

Lose no time in securing your chart.

Last week's announcement of the Ferranti "de luxe" edition of the "Popular Wireless" "Apex" Receiver met with an instant welcome from all parts of the country.

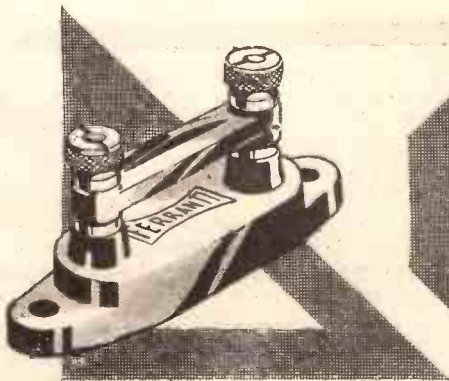
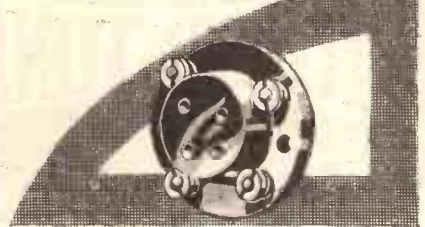
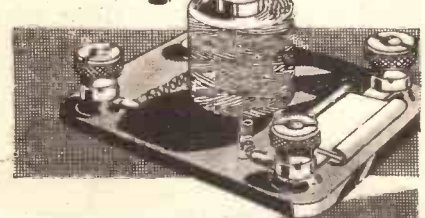
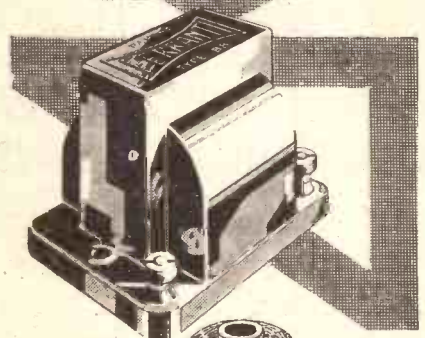
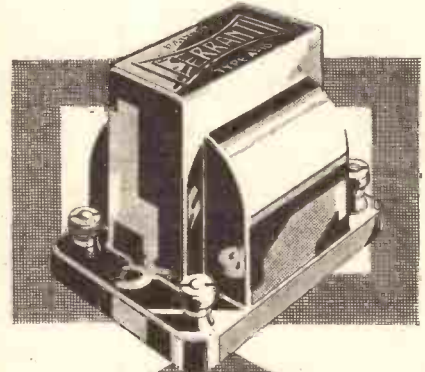
This was only to be expected. The "Apex" is an exceptionally good set, at a modest price, designed by acknowledged experts. It embodies many special features, a novelty being the possibility of adding a short wave range to the long and medium wave ranges which the "Apex" already possesses.

The Ferranti "Popular Wireless" "Apex" is a receiver you can build with every confidence, backed by the reputation of "Popular Wireless" and of Ferranti Ltd.

THE CONSTRUCTIONAL CHART and WORKING DIAGRAM is yours for the asking—free from your dealer, or 1½d. stamp if applied for to Ferranti direct.

Get your chart without delay, and begin work on a set that really satisfies. Remember, any set that employs Ferranti parts is a better set.

Some of the Key components embodied in the Ferranti "Popular Wireless" "Apex."



FERRANTI LTD., "A" Charts Section, HOLLINWOOD, LANCASHIRE

A BATTERY SET BECOMES A BETTER SET WHEN ELECTRIFIED WITH REGENTONE



An all-electric receiver is constant in efficiency of output, because the supply of power never varies.

If you have a battery set or a battery kit set, why not enjoy the advantages of All-electric Radio in the cheapest way possible. Join up a REGENTONE Mains Unit in the same manner as a dry battery, connect to the electric supply socket, and your set becomes permanently powered by the mains at a cost not exceeding 6d. per month. Regentone mains units cost from 39/6, or 8/- down.

6 STAR FEATURES COMMON TO ALL REGENTONE MAINS UNITS

- ★ Seven voltage tappings.
- ★ Line voltage output regulator.
- ★ Solid drawn steel case.
- ★ High capacity smoothing.
- ★ One efficiency only.
- ★ Price determines current output.



THE SYMBOL OF INDIVIDUAL CRAFTSMANSHIP
REGENTONE LTD., Regentone House, 21 Bartlett's Buildings, E.C.4
Telephone: Central 8745 (5 lines)
Irish Free State Distributors: Kelly & Shield, Ltd., 47 Fleet Street, Dublin.

ALL AT



Here are three Blue Spot Cabinet Speakers which sell for a very moderate price and are exceptional value for money.



100U This speaker, in beautiful oak, houses Blue Spot Unit 100 U. It is equal in every degree of performance to all the but expensive "top grade" moving-coil speakers. It reproduces every note and every word with natural "true-to-life" exactness. Sensitive even to small inputs it can be used with battery or all-mains receivers. It can also be used with normal or Pentode valves without matching transformer. Price **52/6**



45R A very distinctive cabinet speaker in high-grade oak. The unit is the famous 66 R which gives enormous volume without the slightest distortion. 45 R will give you music loud enough to fill a hall or soft enough for a small room, with every note clearly defined and perfectly reproduced. Price **52/6**



44R A unique design in oak of rare quality and beautiful finish. Once again the famous 66 R unit is employed. You can listen to 44 R with the certainty of perfect enjoyment, for everything is reproduced exactly as the original. Nothing is added and nothing taken away. Speech, song and music are wholly perfect, with every gradation of light and shade intact. Price **52/6**

MANCHESTER
MAIN HALL—
STAND 62



EDINBURGH
BLOCK A—
1, 2, 7 & 8

BRITISH MADE. Send for Catalogue P.W. 53.S.
THE BRITISH BLUE SPOT COMPANY LTD.
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Telephone: Clerkenwell 3570. Telegrams: "Bluospot, Isling, London."
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H. C. RAWSON (Sheffield and London), Ltd., 100, London Road, Sheffield; 22, St. Mary's Parsonage, Manchester; 44-46, High Bridge, Newcastle; 37, 38, 39, Clyde Place, Glasgow.

When the higher notes are missing RECTATONE restores them

YOU NEED IT NOW

Rectatone—the Varley component that restores to their true value the all-important higher notes.

It is by deliberately cutting off these higher notes that to-day's Superhets and ultra-sharp tuned circuits achieve their selectivity. Now comes Rectatone to put them back again . . . and millions know they need it.

VARIABLE COMPENSATION

The degree of compensation may be suited to the particular tuned circuits in use or employed to correct deficiencies due to the loud-speaker or to the acoustics of the room.

RECTATONE

- 1 Has a rising response curve from 1,000 to 4,500 cycles.
- 2 Balances any form of sound reproduction.
- 3 Restores a weakened treble to its correct value.
- 4 Gives a variable compensation and, therefore, complete control of tone correction.
- 5 Gives the required tone correction without an extra L.F. stage.
- 6 Becomes at will and instantly a normal straight-line transformer.
- 7 The ideal L.F. coupling for selective sets.
- 8 Particularly useful where the same L.F. amplifier is used for radio and gramophone reproduction.

THE NEW
RECTATONE
L. F. TRANSFORMER



Ratio 7-1 List No. D.P. 33

Compensation is controlled by a variable resistance of about 5,000 ohms connected externally between the terminals H.T. + and RES.

With a pentode output valve a 2,000-ohm fixed resistance may be connected in series with the variable resistance in order to prevent excessive amplification of high frequencies with consequent liability to self-oscillation.

When Bass and Treble are correctly present, Rectatone preserves them . . . When the higher notes are missing, Rectatone restores them.



To Messrs. Varley, Kingsway House, 103 Kingsway, London W.C.2.

Please send me, free and post free, the

“BOOK OF THE RECTATONE”

Date.....

Name

Address.....

.....P.W.5

KIT KRITICISMS

THIS WEEK: The Slektun "Scout" S.G.3

By Mr. PETER SIMPLE.

WHEN I open the instruction booklet of a new kit set and read that the few simple tools required consist of "a pair of round-nose pliers, a bradawl and a screwdriver, together with a saw for cutting the wooden chassis to the required size." I marvel how anyone can imagine that the "amateur constructor" is dying a natural death.

It would, however, appear that the prevalent tendency to-day in the world of home constructors is a continual struggle to save both time and trouble. Constructor kits are often supplied with panel and baseboard all ready drilled and fixed, sometimes with valve panels factory-wired and treated, like ganged condensers or transformers, as separate units in kit construction.

Easy to Build.

It is, therefore, all the more encouraging to find that at least one leading firm of radio manufacturers has considered the feelings of the enthusiastic constructor like myself, whose pleasure in being able to "build his own" is greatly increased by the fact that he really has seen a complete receiver grow from the bare components.

Messrs. Slektun Products, Ltd., have only recently started to market their "Scout" kit-set, a three-valve receiver on the popular screened-grid, detector and power output lines. But I am confident that this set fills a real need in the home-construction world.

I enjoyed using my saw to cut the baseboard to its correct size; I enjoyed using my bradawl to mark the positions of components from the very clear blue print; I enjoyed watching grow a set which expresses not only the personality of the designer but also the initiative of the builder.

The Slektun "Scout" is an easy set to build. It takes longer than the average kit-set because there is more to do but it should not occupy even the inexperienced for more than one evening.

No Screens.

There are no metal screens to fix, and the wiring is straight as well as straightforward. Two simple connections give provision for a pick-up, and a fuse is combined with the H.T. — wander plug — features essential to modern receiver design.

Adequate spacing of the components makes the wiring easy to carry out, but I would suggest to the makers that it would still further simplify this operation if some guide were

given as to the order in which components should be fixed and the connections made.

The completed receiver is a very business-like piece of work. Intended more especially for the experimenter rather than for the local-station listener, the "Scout" kit includes no cabinet, but the constructor who does not wish to go to the trouble of building one for himself can be supplied with a cabinet designed for the set as an "extra."

The Slektun firm are now marketing the complete kit, which includes baseboard, aluminium foil, drilled panel and all the components (not the valves), for the very reasonable price of four guineas.

I had the set on test on my rather inefficient London aerial for two consecutive evenings during British broadcasting hours and was surprised at the results.

The makers claim, with unusual modesty, that "it is possible to receive Mühlacker with only a trace of the London Regional station as a background." Actually I found that, without any complicated adjustment of the single-knob tuning or of the aerial series and reaction condensers, I was able to receive eighteen identified stations on the medium waveband at loudspeaker strength and without any kind of interference.

Heilsberg and Fécamp, for instance, provided programmes which contained not the

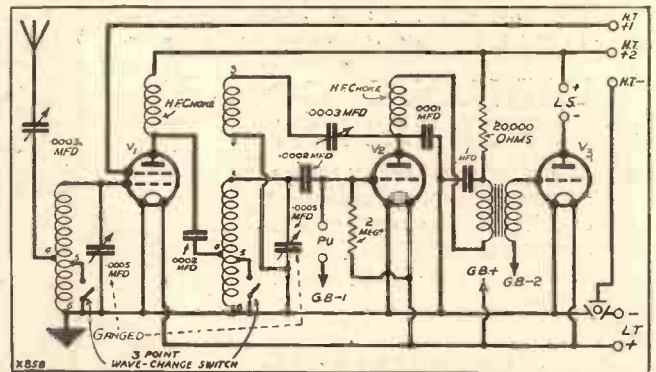
faintest trace of London National, which was all the more creditable since on this occasion I had handed the controls over to a completely inexperienced friend who was anxious to try his hand at tuning a home-constructed set.

Long-Wave Performance.

Certainly the selectivity is all that is claimed for it, while volume and ease of control add to the merits of an excellent set. The Blue Spot 100U speaker, which I keep for comparative tests, showed with no uncertain voice that the output on all the Continental stations was sufficient to provide undistorted and balanced reproduction.

The results on the long waves were not quite so excellent as those below 600

THE WELL-TRIED CIRCUIT



The circuit employs the justly popular S.G., Det. and L.F. arrangement, with ganged tuning of the aerial and H.F. coupling. Reproduction of gramophone records is provided for.

A PROFESSIONAL APPEARANCE



The neat and business-like layout of the "Scout" compares favourably with a "commercial" job.

metres (are they ever?), but all the same, after locating Daventry, Radio Paris, and the rest, I was able to enjoy half an hour of Maurice Chevalier from Hilversum so free from interference that even my limited French could cope with the songs and patter.

Incidentally, any discrepancy which may arise through incorrect ganging of the condensers is fully compensated by the low-loss coils which provide for a correct balance between volume and selectivity.

It might conceivably be thought that the low price of this kit was achieved by cutting down the quality of the components.

One cannot blind oneself to the fact that the overwhelming popularity of radio in this country does provide a first-class opportunity for the unscrupulous mass-producer, whose sole aim is to sell as much as he possibly can, irrespective of subsequent results.

Faultless Design.

But the name "Slektun" has been for so long connected with the finest raw materials and faultless design that constructors need have no qualms about the quality and the craftsmanship of these components.

The Slektun manufacturers maintain that the "Scout" reaches a high standard of quality in the three essentials—efficiency, simplicity and low cost. Personally, I feel that the ambitious though not-too-expert home enthusiast who wants to build every bit of his set and then be able to tour Europe without too much "knob twiddling" will welcome the Slektun "Scout" S.G. as a set which has been designed to meet those very needs.



**ONLY
4.5 MILLIAMPS!**

And at only 100 volts high tension; and yet the P.M.22A is a sensitive pentode giving large output for quite small input. For a pentode such low consumption is remarkable—no greater than that of an ordinary power valve. That means the P.M.22A can be used in small battery and portable receivers where a 100-volt high tension battery is used.

Where high tension up to 150 volts is available, the P.M.22A gives even larger output and is ideal for use in receivers where extreme economy in high tension consumption is essential.

Mullard

THE · MASTER · VALVE

Price 17/6
MADE IN ENGLAND

Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C. 2

4/15

I BROKE off last week right in the middle of my remarks about the switches for the "Apex." But I had at least concluded my discussion of the "two-point" type, and so I can go straight on with the "three-point" one.

There are two reasons why I am engaging in much more detail than is usually done in radio constructional articles. Firstly, I want to make success certain for every single builder of our new "star" set whatever his or her previous experience (or lack of it). And, secondly, the majority of the information has a general application

WHAT THE "APEX" IS AN EASY-TO-BUILD AND COMPACT S.G. THREE EMBODYING THE LATEST CIRCUIT DEVELOPMENTS AND USING UP-TO-THE-MINUTE COMPONENTS.

as well, and should, therefore, prove of interest and assistance to every radio enthusiast, even to those who do not happen to want to assemble the "Apex."

The "three-point" wave-change switch has three terminals, and in its one position all those terminals are joined together.

The 30,000-ohm resistance carries all the H.T. of the detector valve, and so it is vital that it should be of reliable make. Although in one case a 1-watt type is specified, this is because of the catalogue grouping of the particular manufacturer, and need not necessarily lead you to think it is a prime requirement that the 30,000-ohm resistance should be able to handle 1 watt of electrical power.

In actual fact, it is dubious whether it will be asked to deal with more than a tenth of that in the majority of instances.

Nevertheless, it must be borne in mind that it is to act as a current-carrying resistance, and as such it must be made in accordance with definite rules or it is bound to give trouble.

A wire-wound resistance is almost certain to be O.K., but there are now quite

substitutes. (I will be dealing with this and other constructional points in detail in due course.)

The "four indicating terminals" are terminals marked L.S. -, L.S. +

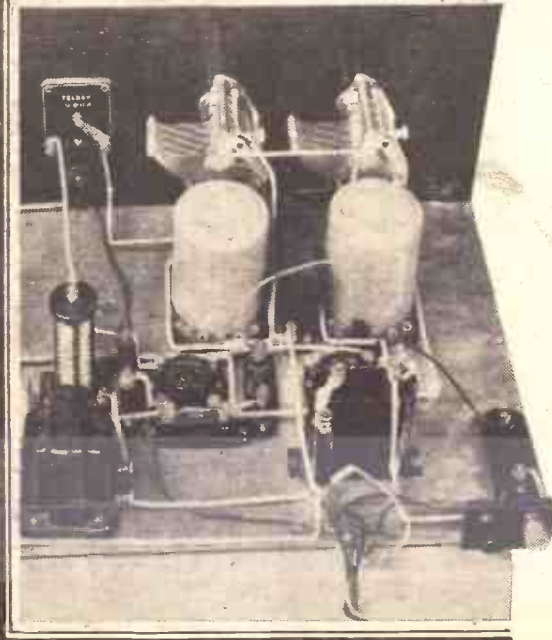
MORE



The Apex

By G. V. DOWD

These "Apex" articles are packed with information, course, our latest star set in particular. A large opportunity of building a first-class modern set, comprehensive development, but all should find its de



SPACE CONQUERORS

Very special discrimination was employed in selecting the makes of components and arranging the circuit of the screened-grid H.F. stage.

We aimed at and achieved a high degree of selectivity without power loss and an absence of "break through."

Dozens of different parts were tried before we were satisfied that we had wrung the utmost efficiency possible out of the circuit.

It must be remembered that the "Apex" ultimately becomes (if you desire) a tri-band receiver, and so a degree of efficiency which may be regarded as adequate for an ordinary broadcast set would be below the level necessary. Some readers will add the short waves, but all benefit by the design being "hotted up" in this manner.

(these two are for the loudspeaker), Earth and Aerial.

The "5-way battery cord" is for the L.T. and H.T. battery connections. It obviates the necessity of providing separate terminals, for at the one end the appropriate branches of the cords are connected to points inside the set. And at the other end proper wander plugs and terminals for direct connection to the batteries are provided.

Making Your Own Cable.

You could, of course, make up your own battery cable, although it is not likely to look as neat as a manufactured article.

A further alternative would be to take five separate and single flexible leads out from the set, but that would be definitely untidy! If you must make your own battery leads, I urge you at least to bunch them together neatly at the set, and run them as a tidy bunch for a short distance before they branch out to their separate destinations at the batteries.

And always employ a stranded rubber-covered flexible wire for battery leads. The one half of twin flex, such as is used for domestic lighting and other appliances, is the kind of stuff that most of us recruit for the purpose.

The "terminal strips" are two in number and each has to carry two terminals. They can be purchased ready drilled at any radio shop, or you can take two pieces of 1/8-in. or

In its other position the three terminals are completely separated.

There is another type of switch having three terminals. This is the single-pole change-over. This type is of no use at all in the "Apex."

a few made of composition which can give even the wire-wound types points.

The copper foil is needed to act as a partial baseboard shield. It is merely tacked down to the surface of the baseboard. Tin or lead foil would be good

A FULL
BLUE
OF
REC
WAS
FREE
EVER
OF
LASK

YOU WILL BE ABLE TO ADD SHORT WAVES TO YOUR "APEX"

ABOUT



PEX

NG, Associate I.E.E.

tion concerning home construction in general and, of proportion of our readers will no doubt take the possessing unique potentialities of easy and inex- scription absorbingly interesting and very helpful.

$\frac{1}{4}$ -in. ebonite and make them yourself, for it is an easy enough job.

Each strip is 2 in. in length by $\frac{1}{4}$ in., and the centres of the terminals are separated by exactly 1 in. If I

knowledge of the art, it is by far the safest course to build a set in strict accordance with the design down to the tiniest detail.

Another item in the components' list appears as "Wire and Sleeveing."

This refers to the material needed for wiring up the set. We advise 18 gauge tinned-copper wire and insulating sleeveing. You will require about 18 ft. of each.

Do not attempt to use a cotton-covered wire, such as is employed in coil winding, for the task, as it is untidy material at best when used for wiring up sets.

You will also need short lengths of rubber-covered flexible (similar to that recommended for the battery leads) for the aerial coil plug, grid bias and S.G. anode connections. The final entry in the

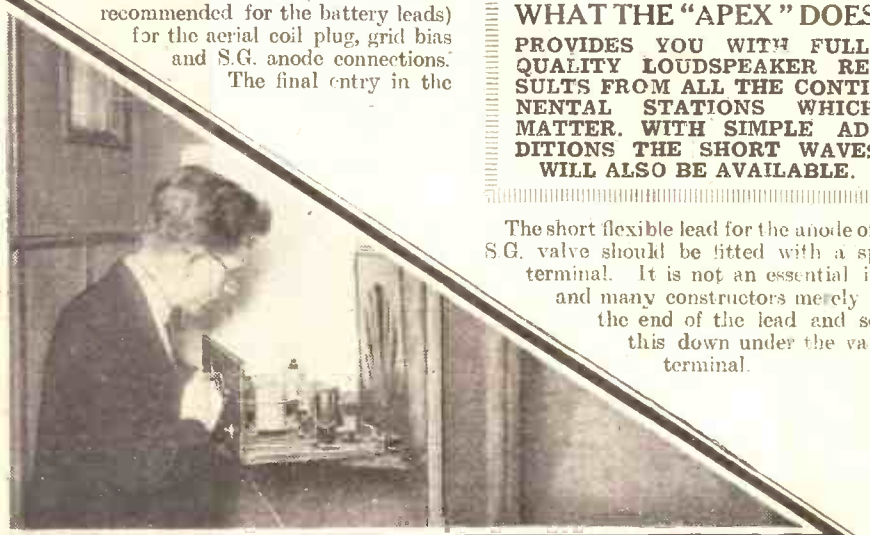
round- and flat-headed, brass wood-screws you will be able to cope with practically everything from fixing the panel to securing the L.F. transformer.

Now and then you are apt to come up against a component which wants extra long, unusually thin, or some other awkward, shape of screw, and then all you can do is to grumble at the thoughtlessness of the designer and purchase special screws.

The "wander" plugs needed are those for the H.T. battery (if you don't buy a battery cord) and grid bias (two for this as per blue print). The aerial coil plug is supplied with the coil.

WHAT THE "APEX" DOES PROVIDES YOU WITH FULL-QUALITY LOUDSPEAKER RESULTS FROM ALL THE CONTINENTAL STATIONS WHICH MATTER. WITH SIMPLE ADDITIONS THE SHORT WAVES WILL ALSO BE AVAILABLE.

The short flexible lead for the anode of the S.G. valve should be fitted with a spade terminal. It is not an essential item, and many constructors merely bare the end of the lead and screw this down under the valve's terminal.



L-SIZE
PRINT
THIS
EVER
GIVEN
WITH
COPY
W."
WEEK

say a $\frac{1}{4}$ in. or so departure from any of these figures doesn't matter a scrap, I don't want any of you to apply the principle elsewhere.

I once said in an article: "this is a set which is constructionally untemperamental, and minor variations from the specification will cause no trouble at all."

I happened to see some practical interpretations of my words at a later date. The people in question must have read "minor" as "major"! Anyway, I could hardly recognise the peculiar contraptions which resulted.

Ample Margins of Safety.

That was a long time ago, and ever since I have been careful to make it clear to readers that no liberties at all can safely be taken with any design unless express and definite licence is indicated.

We always design our "P.W." sets with ample margins of safety, and that is our readers' assurance against trifling errors of component placement.

With the "Apex" I could indicate quite a few components which could be shuffled about a lot without serious trouble resulting. But I am not going to do so, for the simple reason that there are many newcomers who might draw wrong conclusions.

In their haste to get their "Apex's" on the air they might not read my article as carefully as they should.

Anyway, whatever the constructor's

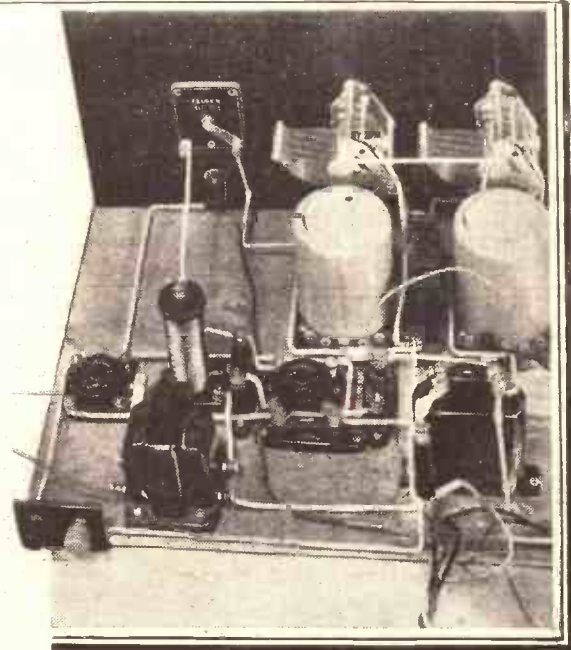
TONE QUALITY

The L.F. end of the "Apex" follows on the lines of the best simplified modern practices. Full quality loudspeaker reproduction is given, and there is "decoupling" and "H.F. stopping" to ensure complete stability and freedom from distortion.

There is space for the accommodation of a newly introduced tone control. The fitting of this is optional, as with the short-wave additions, and can be done at any time. This application of the famous "P.W." progressive principle renders the "Apex" the most attractive home-constructor design of the present day.

components' list reads: "Plugs, screws, etc." You will require screws for fixing the panel and terminal strips to the baseboard, and for mounting the components. It is the practice of many manufacturers to provide suitable fixing screws, and I wish that practice was more widespread.

However, you will find that if you have a good supply (say five or six dozen) of $\frac{3}{8}$ -in.



Well, now I think I have said all there need be said about the components and materials for the "Apex," although I might add, in conclusion, that wood is a fairly good substitute for ebonite as a panel,

(Continued on next page.)

AND ENJOY WORLD-WIDE RECEPTION WITHOUT COIL-CHANGING

MORE ABOUT THE "APEX"

(Continued from previous page.)

and that five or seven-ply wood should be chosen for the baseboard.

You may be able to get your panel drilled by the people who supply it; certainly if you purchase a complete kit of parts for the "Apex" you will have this

VALVES FOR THE "APEX."

	H.F. Stage	Detector	Output Stage
Mullard ..	P.M.12	P.M.1H.L.	P.M. 2 A
Cossor ..	220 S.G.	210 H.L.	220 P.A.
Mazda ..	S.G.215	H.L.2	P.220
Marconi ..	S.22	H.L.2	L.P.2
Osram ..	S.22	H.L.2	L.P.2
Tungsram ..	S.210	H.210	P.220
Lissen ..	S.G.215	H.L.210	P.220
Six-Sixty ..	215 S.G.	210 H.L.	220 P.A.
Eta ..	B.Y.6	B.Y.1814	B.W.1304

The S.G. valve chosen should preferably be of the metallised type.

work done for you. If you decide to do your own, and it is not difficult, you can get the required details from the special diagrams which appeared last week.

Alternatively, you can lay your full-size blue print over the panel and prick your centres through it and into the ebonite with a bradawl or some other sharp instrument.

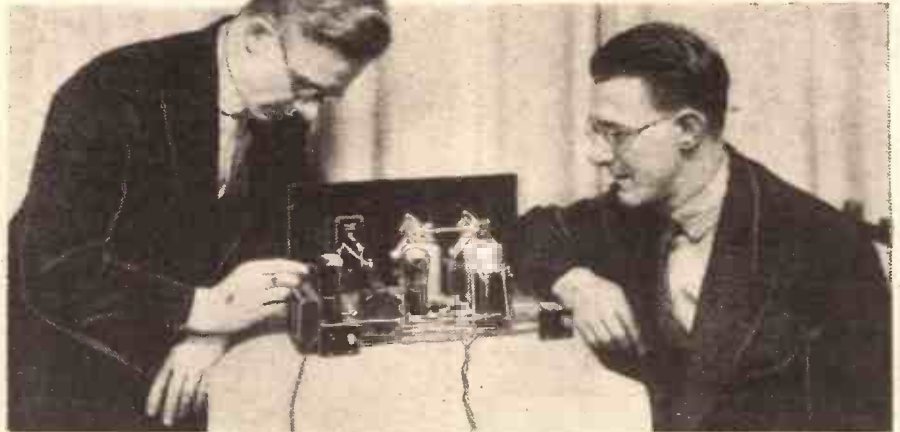
The sizes of holes needed might vary slightly as with different makes of components, but a $\frac{3}{8}$ -in. metal-working drill will be suitable for the large majority. An exception is the type of switch used as the on-off on the "Apex." This will want a trifling larger hole. However, you can drill a $\frac{3}{8}$ -in. hole and enlarge it carefully with the blade of a substantial pair of scissors or the tang of a file.

Of course, the terminals on the terminal strips have smaller holes, and if you make

your own terminal strips you will need $\frac{1}{8}$ -in. holes in them.

The holes for the panel and terminal strip holding screws can also be $\frac{1}{8}$ in. These, should, if possible, be countersunk so that the heads of the screws sink to the level of the ebonite surface. Countersinking can be done by paring bevels to the holes with a pocket knife, and the task is not as tricky to carry out as it may appear. And it is worth doing, because nothing looks untidier than projecting screw heads.

PERFECTLY COMPLETE—COMPLETELY PERFECT



It is important to note that even without the additions the "Apex" can compare with any S.G. Three for performance and appearance.

Mount the components on the panel before you screw this in place, and see that they are all rigidly fixed.

The copper foil can be secured to the baseboard with three or four tacks, as you can leave it to the components to hold it in place, although at least one corner will awkwardly endeavour to rise and require a little coaxing before it will lay flat!

The coil, valve holder and fixed condenser are placed directly on to the copper foil, through which holes should be punched with a bradawl for the securing screws.

and screw this tag under the nut of the earth terminal.

You must, of course, ensure that nothing else makes contact with the copper foil, and this particularly applies to the anode lead of the S.G. valve and the high-tension lead which goes to the 30,000-ohm resistance.

This resistance is held in position by the lead that joins its other (top) end to the 2-mfd. fixed condenser, and so this lead must be substantially made.

(Continued on page 241.)

THE COMPLETE SHOPPING LIST FOR "P.W.'s" LATEST STAR SET

- | | | |
|--|---|---|
| 1 Panel, 14 in. x 7 in. (Peto-Scott, Goltone, Permcol, Wearite, Becol). | 1 1-mfd. condenser (Telsen, or see above). | Wire and sleeving. |
| 2 Screened coils (Colvern type T.D.). | 2 .0005-mfd. slow-motion variable condensers (Ormond No. 6). | 1 5-way battery cord (Goltone, Bulgin, Belling & Lee). |
| 1 .0003-mfd. solid dielectric reaction condenser (Telsen, Ready Radio, Polar, Graham Farish, Lotus). | 1 2-meg. grid leak (Ferranti with holder, Graham Farish, Lissen, Dubilier, Telsen, Igranic, Ediswan, Ready Radio, Mullard, Watmel). | 1 Piece of copper foil, 10 in. x 5 $\frac{1}{2}$ in. (Peto-Scott, Ready Radio, Magnum). |
| 1 3-point push-pull wave-change switch (Telsen, Lissen, Ready Radio, Tunewell, Goltone, Wearite, Bulgin, Keystone, Ormond). | 1 30,000-ohm resistance (Graham Farish, Dubilier 1-watt type, Sovereign, Ready Radio "Thermium," Colvern strip, Wearite). | Plugs, screws, etc. |
| 1 2-point wave-change switch (push-pull) (Telsen, or see above). | 1 200,000-ohm resistance (Dubilier 1-watt type, Graham Farish). | |
| 1 On-off toggle switch (Bulgin, Igranic). | 1 S.G. H.F. choke (Ready Radio, Lewco, Slektun, Peto-Scott, Telsen, Sovereign, Tunewell, Wearite, Goltone, R.I., Lotus, Varley). | |
| 3 Valve holders (Benjamin, Lissen, Lotus, Telsen, W.B., Graham Farish, Igranic, Wearite, Ready Radio, Bulgin, Ferranti, Clix). | 1 L.F. transformer (Lissen Hypernik, R.I., Slektun, Ferranti A.F.10, Graham Farish, Tunewell, Ready Radio, Varley Nielec, Telsen, Lotus, Lewcos). | |
| 1 .0003-mfd. fixed condenser (Ferranti, Dubilier, Lissen, T.C.C., Telsen, Ready Radio). | 4 indicating terminals (Belling & Lee, Bulgin, Clix, Igranic, Ealex). | |
| 1 .0002-mfd. fixed condenser (T.C.C., or see above). | 2 Terminal strips. | |
| 1 .0001-mfd. fixed condenser (Dubilier, or see above). | | |
| 1 2-mfd. condenser (Ferranti, Telsen, T.C.C., Lissen, Dubilier, Peto-Scott, Igranic). | | |

THE "APEX" ACCESSORIES

THREE VALVES.—(See separate table).

BATTERIES.—L.T. Accumulator: Oldham, Ediswan, Pertrix, Lissen, G.E.C., Exide.

H.T. Battery: This should be of ample size to deal with the requirements of the valves chosen. Lissen, Pertrix, Magnet, Ediswan, Ever Ready, Marconiphone.

G.B. Battery: See above list.

LOUDSPEAKERS: Blue Spot, Marconiphone, Celestion, R & A, Epoch, H.M.V., B.T.H., W.B., Ormond, Lanchester, Igranic, Clarke's Atlas.

RECOMMENDED AERIAL AND EARTH EQUIPMENT.—Electron "Superial;" Graham Farish "Filt" earthing device.

Read what J. H. REYNER says about FILT!



J. H. Reyner, B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., M.Inst.R.E., Consulting Radio Engineer. The well-known designer of many famous sets described in the foremost wireless publications.

THE FURZEHILL LABORATORIES,
BOREHAM WOOD,
HERTS.
TELEPHONE: ELECTRIC 139.
RAILWAY STATION: ELECTREE (L.M.S.)

J. H. REYNER,
B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., M.Inst.R.E.
CONSULTING RADIO ENGINEER.

24th September 1932.

JHR/LWV.

Messrs. Graham Farish Ltd.
Masons Hill,
Bromley,
Kent.

Dear Sirs,

I have been much interested in the Filt Percolative Earth which you have submitted for test. The importance of a good earth connection is often overlooked, although attention to this point is repaid by improved signal strength and less liability to interference from external sources, particularly with Mains receivers.

A low electrical resistance is the first essential, and you appear to have gone to the root of the matter by providing an earth bowl filled with chemicals which firstly attract the moisture from the surrounding soil and then saturate it with salts of high electrical conductivity.

My tests indicate that the device is both simple and effective and that the earth resistance is definitely lower than is obtained by the usual methods.

I imagine that in the majority of cases the installation of the Filt Earth will give a definite improvement in results.

Yours faithfully,
J. H. Reyner

Why YOU should fit a FILT

Efficient earthing is vital to good reception. Without it you cannot obtain the power, purity or volume of which your set is capable.

Filt is the most efficient scientific earthing system ever invented. As soon as the copper receptacle is buried, the wonderful chemical it contains begins to spread through the soil, making a permanent highly conductive area to a depth of several feet, ensuring perfect earthing in any climate.

Get a FILT to-day. It may put right faults that you thought could only be remedied by expensive new valves or parts.



GRAHAM FARISH FILT PERCOLATIVE EARTH

Obtainable from your radio dealer or post free from the sole manufacturers,

Graham Farish Ltd.
181. Masons Hill - - Bromley, Kent



FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?



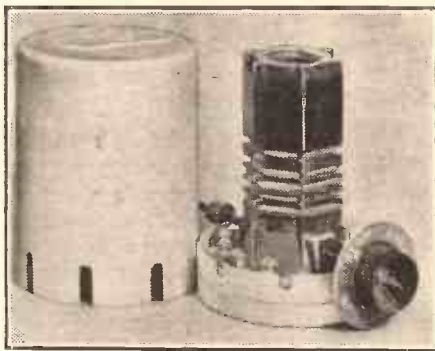
THE TELSEN SCREENED COIL

I WONDER if it is generally realised that the apparently simple development of applying screening to coils has caused what amounts to almost a revolution in the design of home-constructed sets?

To appreciate fully how much simpler it has made the task of the designer, and how much easier the work of assembly for the constructor, comparison should be made between a modern set employing H.F. stages and one of a similar nature two or three years old.

Gone is the necessity of having elaborate inter-stage screening, and even simple

WITH COVER REMOVED



Note the completeness of the shielding in the Telsen Coil and that the "can" is provided with a metal base.

partition shields are no longer an invariable requirement.

It might be thought that it is a simple enough business to put a "can" on a coil, and that this ought to have been a general practice years ago.

But it is not so simple a matter as it may appear. And the efforts of some manufacturers to do so has been attended with less success than is the case with others.

In fact, I know of only three makes of screened coils which I consider are *good* screened coils. The Telsen is one of these three.

It is in every way a first-class component, and I'd recommend it unhesitatingly as such to anyone.

Its losses are low, and it is therefore selective—as selective, in fact, as a good unscreened coil, which is saying something.

Moreover, its screening is really effective, and two of them can be mounted within a couple of inches of each other without trouble being caused by such drastically narrow separation.

It is one of the few coils of any kind which suffers but slightly from medium-wave break-through on to long waves in bad areas, and even then it is not difficult to eliminate the last traces of it.

A wavechange switch is fitted, and by ingenious design it can be ganged with the switch of another Telsen screened-grid coil either in parallel with or at right angles to the panel.

Messrs. Telsen are to be congratulated on the production of what is undoubtedly one of the best components of recent years.

SOME SERADEX PRODUCTS

The following Seradex products recently arrived from Trevor Pepper of Birmingham.

A Glasswound Resistor of 1,250 ohms (price 1s. 6d.); a C.B.S. L.F. Choke, specified as 40 henries, with no D.C., 16 henries at 25 milliamps, with a current carrying capacity of 30 milliamps. (Price 3s. 11d.); a Moulded Wire-End Resistance.

I have tested these components, and in all cases the samples tally closely with their specifications.

The Glasswound Resistance is wire-wound on a glass tube. The sample has a resistance of 1,200 ohms, and could carry its rated 60 milliamps without appreciable heating. It appears to me to be quite sound, and is an article which should appeal strongly to the economically minded constructor.

My only criticism against these Seradex products is the absence of permanent labelling. I believe the makers would be well advised to introduce this even at the cost of slight increases in price.

It is true that paper labels were attached to two of the items, but one quickly came off, and, I regret to admit, got lost!

AN "ATLAS" LOUDSPEAKER

H. Clarke & Co. (Mscr.), Ltd., have very considerably widened their radio activities during the past twelve months and the range of "Atlas" products now available constitutes an importantly impressive team.

While not new in terms of weeks, the Clarke's "Atlas" permanent magnet moving-coil loudspeaker is an excellent example of the quality achieved by the famous Manchester manufacturers.

It is, indeed, one of the most interesting of this season's lines.

An input transformer is fitted, and this has three terminals enabling correct matching to be obtained either with a pentode or with ordinary three-electrode power-valves.

The cabinet is a fine piece of work and has a solidity and finish not often encountered.

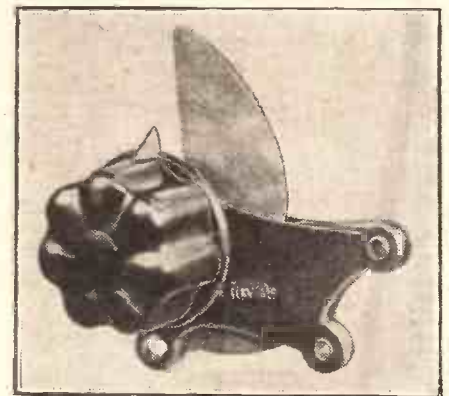
On test we found the speaker to be sensitive and to have a response that earns it a place among the few entirely satisfactory instruments of its class.

"MICROLOG" CONDENSER

Solid dielectric variable condensers would undoubtedly be used more widely than they are, although they are quite popular as it is, were it not for the fact that they have not reached a universally adequate standard for purposes other than reaction control, selectivity adjustments, etc.

This is because there has been a tendency to employ poor quality bakelised materials as the "solid dielectric," with consequent serious dielectric losses. There have been

NEW DIELECTRIC



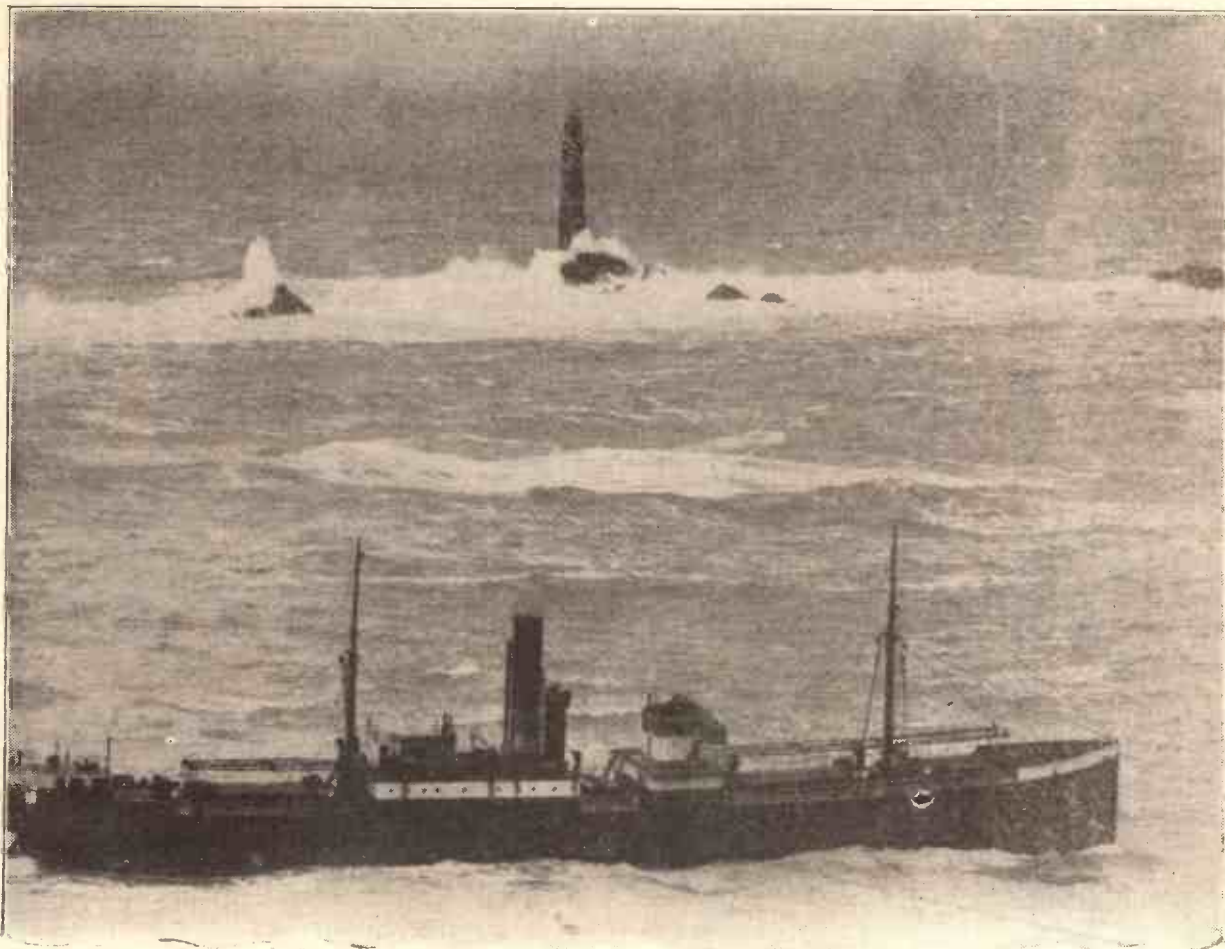
A new low-loss insulating material is employed for vane separation in this Ready Radio condenser.

exceptions, and a recent example is seen in the Ready Radio "Microlog," in which a good quality cellulose substance is used.

Other features of the "Microlog" are that it has hard-brass moving vanes of correct modern shaping and a substantial pigtail to ensure good connection to them.

It is also a robustly constructed and cleanly finished component.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department with the strictest of impartiality, under the personal supervision of the Technical Editor. We should like to point out that we prefer to receive production samples picked from stock, and that we cannot in any circumstances undertake to return them, as it is our practice thoroughly to dissect much of the gear in the course of our investigations! And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are, therefore, framed up in a readily readable manner, free from technicalities unnecessary for that immediate purpose.



Beacon Stations trust to MARCONI VALVES

DAY in day out the beacon station must rap out its Morse, every half hour in fair weather, continuously in fog. Human life and the safety of the vessels in its vicinity depend on that message. The Beacon is an invisible lighthouse and it must never fail. Trinity House dare not risk a faulty valve. That is why they—and the Coastal Authorities of most maritime nations use Marconi Valves. *When lives may depend on a valve they choose Marconi.*

MARCONI A.C. MAINS VALVES

There is a type to give very best results in every position of the A.C. all-electric receiver. Each is constructed to the very latest standards of durable efficiency, a high mutual conductance being combined with long life and silent operation.

This is the curve for Marconi M.H.4. a

general purpose type. Note how steep is the slope, despite the length and straightness of the working position.

MARCONI A.C. SERIES

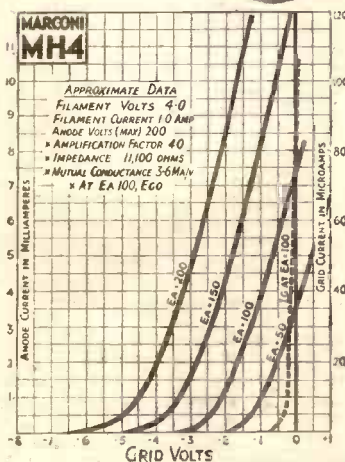
- * VMS4 Variable-Mu S.G. 19/
 - * MS4B S.G. (Single Stages) 19/
 - * MS.4. S.G. (Multi Stages) 19/
 - * MH.4. General Purpose 13/6
 - * MHL.4. General Purpose and L.F. 13/6
 - ML.4. L.F. and Power 15/
 - PX.4. Super Power 17/6
 - PT.4. Pentode (Directly heated) 20/
 - MPT.4. Pentode (Indirectly heated) 20/
- * Available metallised, if desired.

WHAT IS THE PURPOSE? —

WE HAVE THE VALVE!

Ask your local dealer or write direct to The Marconiphone Company, Radio House, Tottenham Court Road, London,

W.I. for the Marconi Valve Folder which gives curves, facts and figures for all types of Valves.



Yet another circuit triumph
'straight 3'
 with **screened**

*Build the
 amazing*

TELSEN

**FULL SIZE 1/- BLUE PRINT GIVEN FREE WITH
 THE NEW AND ENLARGED TELSEN RADIOMAG!**



Telsen technicians have achieved a really sensational triumph of circuit design with the brilliant new AJAX 3! For here, at last, is a receiver which is as cheap to build, as economical to run, and as simple to operate as only a "straight" three can be, yet which is capable of such tremendous range and power, such hairline selectivity and such a superb quality of reproduction that it literally sets an entirely new standard of performance for receivers of its type! Yet it is not a "Kit" Set, but purely a circuit design using specified Telsen Components (some of which you may already have!) whose construction has been so tremendously simplified that even the absolute novice cannot help but make a perfect job of it! Free full size 1/- Blue Print of this and other sensational circuits, together with simply worded and clearly illustrated constructional details, are contained in the new Telsen Radiomag, Issue No. 3, price 6d. Get your copy now — from your radio dealer or newsagent.

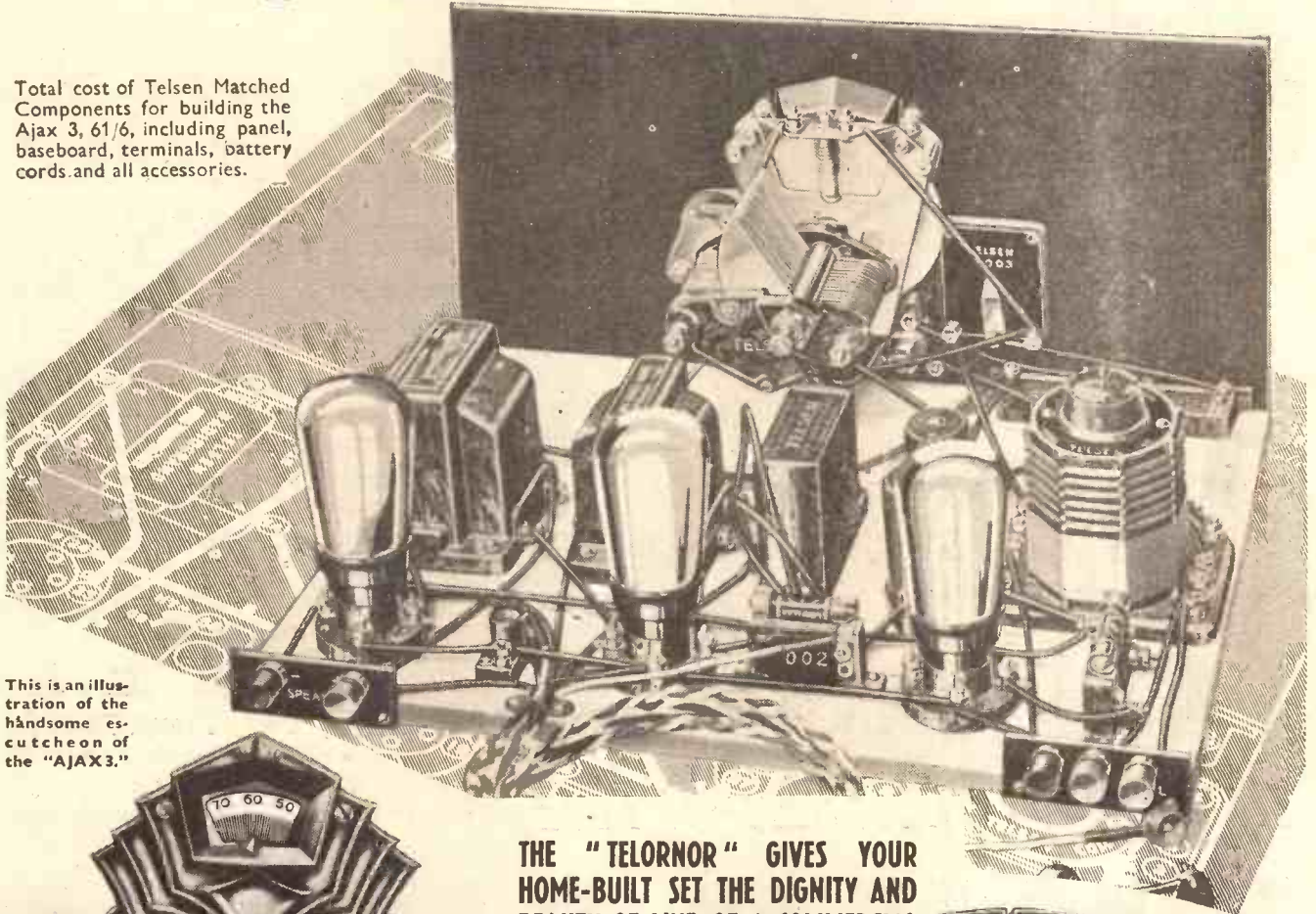
Make sure you get your TELSEN RADIOMAG NO. 3

by Telsen technicians!

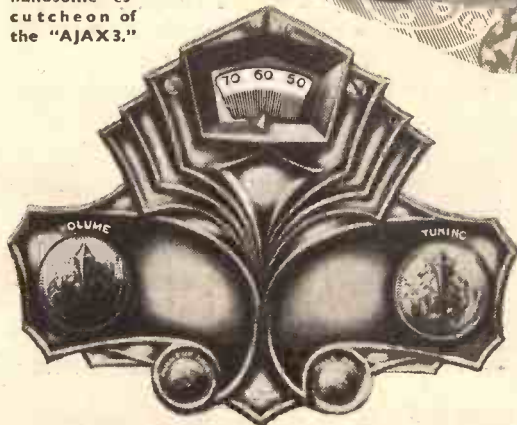
economy
grid *brilliance!*

AJAX 3

Total cost of Telsen Matched Components for building the Ajax 3, 61/6, including panel, baseboard, terminals, battery cords and all accessories.



This is an illustration of the handsome escutcheon of the "AJAX3."



THE "TELORNOR" GIVES YOUR HOME-BUILT SET THE DIGNITY AND BEAUTY OF LINE OF A COMMERCIAL RADIO RECEIVER.

The escutcheon plate embodies an illuminated variable ratio slow-motion disc drive which permits of exceptionally fine tuning for distant station reception.

TELSEN

RADIO COMPONENTS



**A NEW SET...OR A
RENEWED SET**
*at a fraction of
the cost*

Perhaps your radio reception is on the downward path. Fewer stations; less volume; worse tone. Your set is not to blame. Your set is as up-to-date to-day as it was a year ago. It's your valves; they are not pulling their weight.

Renew your set throughout with Tungram Valves. Make it as good or even better than when you bought it or built it. More stations; increased volume; perfect tone. But it must be Tungram! For this reason: Tungram Valves are the most efficient that modern science has so far produced. Tungram Valves are used by 61 British Set Manufacturers. But they cost very much less than the price you're used to paying. You cannot get Tungram quality in any other valve even by paying twice the Tungram price!

Insist on Tungram. Don't be put off. Go to a Tungram dealer; take nothing but Tungram!

RENEW YOUR SET WITH

TUNGSRAM

If in difficulty write for literature and for the name of your nearest Tungram dealer to

*Tungram Electric Lamp Works (Gt. Britain) Ltd.,
Radio Dept., S.T. 3 Commerce House, 72, Oxford St., London, W.1*

BARIUM VALVES

"HOTTING UP" A ONE-VALVER

BY W.L.S



In this article our short-wave expert gives a number of simply applied expedients for improving the performance of a set working on wave-lengths below the 50-metre mark.

SOME little time back, in "Short-Wave Notes," I explained that the single-valve short-waver that I described in "P.W." was not an exact replica of my own, but rather a "tame" version of my own somewhat fiercer receiver.

Ever since then I have been receiving letters beseeching me to let the cat out of the bag and to give some hints on the "hotting-up" of short-wavers, particularly single-valvers.

At the risk of disappointing readers, I am giving away a few of the ideas herewith. But one should always remember that "hotting-up" a set is like applying the same process to a motor-car—it isn't all honey, and it can't be done for nothing.

Good for the Accumulator.

I am afraid the first recommendation will promptly be put out of court by quite a number of readers. That is, use an indirectly-heated valve, even if you run it from an accumulator, as I do. It takes 4 volts, 1 ampere instead of 2 volts, .1 ampere; but, as I said, you can't do these things for nothing.

The difference between an indirectly-heated detector valve and the usual battery-operated valve makes the change, in my opinion, well worth while.

Furthermore, if one has a 4-volt accumulator of respectable size about the place, it certainly does it more good to be discharged at 1 ampere and charged frequently than to be lying about doing the nearest possible approach to nothing!

The next hint will also prove unpopular. It is "increase the H.T." I am now using 150 volts on my detector; it has been going up by steps until it has now reached this figure, and I don't expect to increase it any more, although the only short-wave single-valver I have heard that seems to beat my own is one using the extraordinary figure of 230 volts H.T.

Comprehensive Screening.

In my own case I simply kept on using tighter and tighter aerial coupling, until it was necessary to put the H.T. up to keep the set oscillating. This would be a mistaken policy on a two-valver, but seems satisfactory with a "single," as one starts off with such a very quiet background.

I don't want to brag about my "single," but it is a fact that most folk who hear it remark that it is as loud as, or louder than, their "twos." I put this down mostly to the very tight aerial coupling that one can use.

Hint No. 3 is—build the whole set in a

metal box. Use one large enough not to act as a mere coil screen, and see that the coils do not approach within about 2 in. of the metal sides at any place.

The size of the box housing my own "one" is 10 in. by 6 in. by 6 in., and the coils are well clear of the aluminium.

The remaining suggestions are matters of small circuit alterations, which must be tried out experimentally.

Grid-leak and Condenser.

Make sure that your grid condenser and leak suit your particular valve. With some valves the best signals will be found with a .0001 condenser; with others an increase to .0003 will improve things. I couldn't tell you the size of mine, because the capacity is stamped on the bottom, and it is very firmly bolted down! I believe, as a matter of fact, that it is .0001.

you will find another worth-while addition in the shape of a much smaller condenser (about .00002) in parallel with it.

I have two such condensers, both equipped with good slow-motion dials; the larger covers the usual bands of 18-30 metres and 30-60 metres, while it may be stopped at any point and the band explored more thoroughly with the small one.

As an example, the broadcast band between 46 and 49 metres occupies but four degrees on the .0001 condenser; on the other it spreads over 30 to 40 degrees, and tuning is as easy as it is on the medium broadcast band.

Spreading the "bands"

The amateur bands, too, are nicely "spread" on the smaller condenser, the 40-metre band taking the full 100 degrees. For calibration purposes this condenser is

A STATION TO SEARCH FOR



A corner of the Bombay station studio. This station transmits experimentally on 49 metres, usually on Mondays, Wednesdays, and Fridays from 5.0 to 6.30 p.m.

The same applies to the leak. Mine has a resistance of 7.5 megohms; until recently I was using 10 megohms, but that leak became noisy, and I put in the nearest replacement that was available.

Always use a de-coupling resistance (even with a one-valver!) My H.T. is slightly reduced by a 10,000-ohm resistance in series with it, by-passed to earth by four microfarads.

Assuming that you are working with a tuning condenser of about .0001 capacity,

set at 50 degrees and the set calibrated on the .0001. On the scale of the latter the setting for the 20- and 40-metre amateur bands are marked, and when these points are reached the tuning is simply taken up on the other dial.

There is, of course, an opportunity for "hotting-up" outside the set. I use a pair of really first-class phones, for one thing. This may sound like "cheating," but I don't see why one should waste watts on L.F. amplification.

THE MIRROR OF THE B.B.C.

By O. H. M.

ALTERNATIVES TO ST. MARTIN'S.

OPERA TROUBLES—LANCE SIEVEKING FOR VAUDEVILLE—
THE "CENTRAL ELEPHANT"—WORCESTER'S WEEK.

FOR many years the B.B.C. has made the religious services on the second and fourth Sundays of each month compulsory from St. Martin-in-the-Fields, with no alternatives on the main wavelength. This has caused some comment in certain religious circles, including both the Roman Catholics and the Northern Nonconformists. The matter has now come to a head with considerable pressure being brought to bear on the B.B.C.

I do not know what is going to happen, but I do know what should happen, and that is that St. Martin's should be left in the field with alternatives, if any, of a general entertainment character. I wonder how long it will be before the B.B.C. realises that it is doing itself and religion only harm by denying appropriate entertainment alternative in the early main period of Sunday night programmes.

The Belgians and the B.B.C.

A special Mission from the Belgian Broadcasting authorities has been visiting London to examine closely the working of the B.B.C. with a view to developing talks and education on similar lines. I gather that this represents the advance guard of a number of other similar investigations from abroad.

Incidentally, the particular nature of the Belgian mission means that the Germans are no longer regarded as superior to the B.B.C. on the serious side of the work.

A New Opera Crisis.

Opera politics are blowing up again. This time with a good deal more venom and hopelessness than ever before. It seems certain that the subsidy is doomed, and that Covent Garden will have a precarious existence, if any, next year.

The concert world also has turned away from its co-operative mood and it looks as though enmity towards the B.B.C. is becoming a dominant factor. So far as listeners are concerned, there is no cause for anxiety. The B.B.C. musical work under the steady guidance of Dr. Adrian Boult will pursue its course undisturbed and programmes will continue to improve.

So far as the music-loving public is concerned, those who insist on attending direct performances either of concerts or of opera will not have cause to complain a few years hence if, as is possible, the B.B.C. withdraws from public performance, for which it gets singularly little credit.

Vaudeville Experiment.

The recent changes in the Control of Vaudeville at Broadcasting House have not effected the results anticipated. There has been some technical improvement, but no noticeable elevation of the main conception.

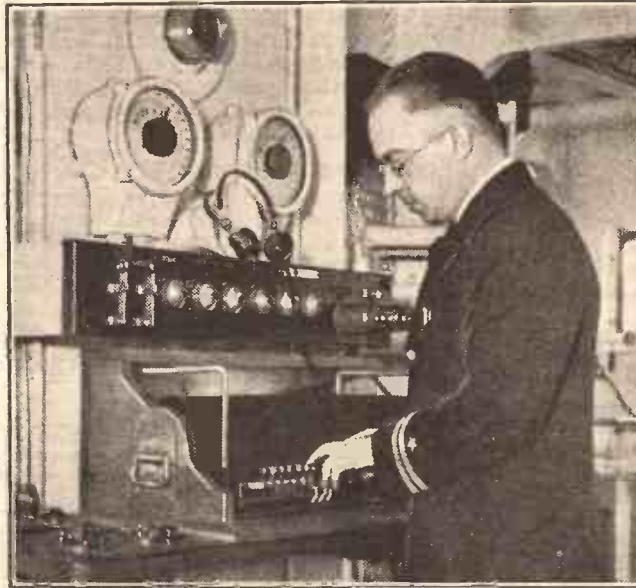
I hear, however, that Mr. Lance Sieveking is going to take part in Vaudeville work for a trial period of six months or so. I have hopes that Mr. Sieveking may give to this

very important development of programme work the distinction it sadly needs.

Sets for the Unemployed.

I was interested to hear the other day that the Central Council for Broadcast Adult Education has allotted one of its group listening receivers to the unemployed club at Whitehaven, in Cumberland. I do not know to what extent these sets are

DREADNOUGHT OBEYS A MINESWEEPER



With this control apparatus fitted on a small minesweeper a specially equipped Dreadnought, steaming past over the horizon, was made to stop, turn to starboard or port, and generally do as she was bid, during recent U.S. naval manoeuvres.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

MR. JOHN WATT'S methods of production have always appealed to me, for he never allows his shows to pall: from start to finish they never lose that freshness which is so essential to his type of entertainment.

It is for this reason that his last series of entertainments, "Songs from the Shows," need never have ended.

The supply of songs on which he drew seemed inexhaustible, and it was the kind of song that gave pleasure to a multitude of listeners.

We specially welcome then his new series just begun. The first instalment, songs on the famous George Edwardes' productions, at the Old Gaiety, suggests that Mr. Watt is relying on the same methods as before, so I see no reason why the series should be limited to any given number.

available, but it seems to me that if the "Central Elephant," as the Central Council is called, would pay more attention to this sort of thing, and rather less attention to its high-brow aspirations, there would be a better chance of justifying its proceedings and expenditure when these are reviewed by the Parliamentary Committee on Broadcasting of 1935.

Worcester's Great Week.

Worcester is the first county to be represented in the new Midland County Week series of programmes upon which Mr. Percy Edgar and his staff at Birmingham have been working for the past few months.

"Worcester Week" starts on Monday, October 17th, and it will be followed by programmes representative of two or three other counties, after which similar broadcasts will be given at intervals of about a

month until next summer when there is to be a break until next autumn.

The Worcestershire plans include an address inaugurating the series by Councillor Miss Diana Ogilvy, the Mayor of Worcester, on Monday October 17th. This will be followed by a Pageant of Worcestershire, written by Francis B. Andrews, President of the Birmingham Archaeological Society, in which the history of the county from earliest times, when Worcestershire was little more than a few islands dotting a primæval sea, will be described.

The pageant will take listeners through the history of its battles and festivals,

(Continued on page 243.)

I offer no apology for calling readers' attention to a book just published by Putnam—"This Unknown Island," by S. P. B. Mais. Listeners cannot have forgotten that remarkable series of talks that was such an outstanding feature of last winter's programmes. Well, here they are now in book form, giving many people the opportunity they have wanted ever since Mr. Mais said his last "Good-night," i.e. to have them all over again.

"The Unknown Island."

The book contains 34 illustrations and 17 maps, and, what I think adds to the enjoyment of the book is the inclusion of copious notes and letters (abusive and complimentary) that listeners couldn't resist sending Mr. Mais after each talk. "This Unknown Island" is published at

(Continued on page 244.)

READY RADIO S.G. CHOKE

5/6

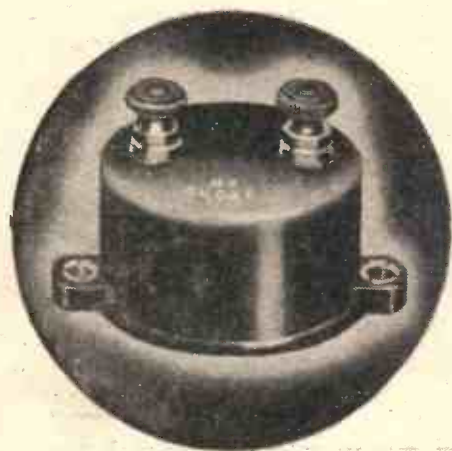


A new H.F. Choke specially designed for screened-grid sets, Highly efficient sectionalised windings almost entirely air spaced.

Self-capacity, D.C. resistance and losses are exceptionally low for a choke of such high inductance.

SPECIFIED
for the
“APEX”

READY RADIO STANDARD H.F. CHOKE



A highly efficient general-purpose choke recommended specially for reaction purposes.

1/6

GO TO YOUR RADIO DEALER
FOR YOUR KENDALL-PRICE
BOOK AND FOR ALL READY
RADIO COMPONENTS

Free

Post Coupon now and we will send you **FREE** the Kendall-Price 36-page 1/- Book (the size of a normal issue of "Popular Wireless"). It shows you how, at the cost of a few shillings, you can bring your present set right up to date. It contains complete instructions, photographs and diagrams of ten modern circuits, both battery and mains-operated.

To READY RADIO LTD. (Book Department), Eastnor House, Blackheath, S.E.3. Please send me the 1/- Kendall-Price Book of Ten Circuits—FREE. I enclose 1½d. stamp for postage.

Name

Address

If you wish to have, with your free book, ten full-sized blue prints, enclose 1/- in stamps with this coupon. P.W.7.



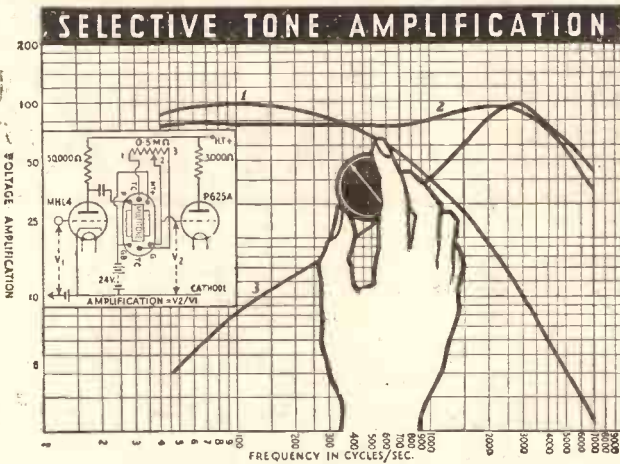
Announcement of Ready Radio Ltd., Eastnor House Blackheath, S.E.3. Lee Green 5678

TRUE TONE CONTROL

NO IMITATION CAN DO WHAT *MULTITONE* MOST DEFINITELY DOES!

Multitone is the only tone control which gives you *selective tone amplification*. Any other form of tone control suppresses one part of the scale in order to give apparent emphasis to other parts. This results in loss of volume, overloading of valves and smaller range of variation. Get a *Multitone* transformer from any reliable dealer. It's very easy to substitute for your existing L.F. transformer or add to an existing Resistance Capacity coupling. Your dealer will be able to do this for you if you are not a constructor, and you can then have perfect tone control.

If you are in any difficulty, write direct to us.



By changing the setting of a Potentiometer, the response-curve of the Multitone Transformer is progressively altered from a falling (1), through a level (2), to a rising (3) characteristic. The limiting responses and an intermediate level-response are shown by these curves. When the response is level, the transformer ratio is 4:1. True Two-way Tone Control is immediately at your disposal on any set. In use all that is necessary is to turn the Potentiometer until the desired overall response is obtained.



Any good Potentiometer exceeding 0.5 megohms can be used with the Tone Control Transformer, but the best results are obtained with the Multitone Graded Potentiometer (price 3s. 6d.) which has been specially designed for this purpose.

17/6

Our Booklet on *Tone Control* will be sent post free on receipt of a postcard.

MULTITONE

TONE CONTROL L.F. TRANSFORMER

Multitone Electric Co., Ltd.
95/98, White Lion St., London, N.1. 'Phone: North 5063

M.C.18



**50 guinea
TONE' for
4/6 or
1/- down**



**And further 1/- in 7 days and
2 monthly payments of 1/6**

Does your Set lack tone? Does it lack balance with your Speaker? Or volume, or realism? If so, let the most wonderful radio invention since valves were introduced—THE HARLIE TONE SELECTOR—prove to you how good your reproduction really can be.

In three minutes you will fit it between your Set and Speaker—any type of Set, any type of Speaker—and then, heigh presto! by simply turning a knob, a choice of different tones is at hand—Normal, Bright, Brilliant, Mellow or Deep. Your Speaker will now be matched to your Set and perfectly balanced. What is more, the Harlie Tone Selector eliminates all needle scratch from your records when used in conjunction with a Pick-up.

All this for only 4/6d. cash. Or Hire Purchase 1/- down, a second 1/- in 7 days, and two monthly payments of 1/6d.



DE LUXE PICK-UP cash price 27/6

For years now Harlie have been recognised as the leaders in Pick-up design. Others follow where Harlie leads, Your proof of Harlie quality is that no less than 27 of the leading Radio-Gram Manufacturers incorporate Harlie Pick-ups, because undoubtedly they are the best.

All the very latest devices are featured, including Built-in volume control; Head Swivel for swift needle release; ball-bearing movement; perfect parallel tracking; twin-spring balance suspension and tension control. It will take you years to wear your records out when used with a 'Harlie' Pick-up.

FREE

An extremely interesting booklet which tells you all about how a pick-up works—how to play records with a superb realism through your radio, and how to eliminate needle scratch—this and much more is told in the new Harlie pick-up booklet. Post coupon below for your FREE copy now.

2/6 DOWN

Further 2/6 in 7 days and 5 monthly payments of 5/-

Harlie
L.P.
Cambridge Arterial Rd.,
Enfield, Middlesex.

Free Booklet
De Luxe Pick-up } Cross out items not wanted,
Tone Selector }
for which I enclose P.O. value (No stamps)
Name
Address
..... P.W.8.

RECEIVERS OF RENOWN



No. 5 THE MARCONIPHONE MODEL "252"— A SELF-CONTAINED BATTERY-OPERATED THREE-VALVE R

MARCONIPHONE is a name that requires no introduction. It stands for all that is good in up-to-date receiver practice, and it is for that very reason that we welcome the firm's entry into the battery-operated receiver market.

This is good news for all who have to rely upon batteries for their radio reception, for even before we describe our tests it is quite obvious that the Marconiphone Company would not have made their entry into such a vast potential market without instruments that would do justice to the reputation that they have earned for themselves in other directions.

Up-to-date Design.

But the proof of the pudding is in the eating, and it is with feelings of satisfaction that we are able to record that our preliminary impressions are fully confirmed as a result of practical tests.

The Marconiphone model "252," like its smaller brother the "248"—a report of which has already appeared in these columns—is a completely self-contained receiver and at the price of £9 17s. 6d., which includes valves, batteries, speaker, and a well-finished cabinet, it represents in our opinion a very remarkable proposition.

The circuit is a modern development of the popular three-valve S.G., det., pentode arrangement, and it includes all the desirable features of an up-to-date design.

Simple Controls.

At the front of the instrument, which is pleasingly attractive in appearance, there are three main controls. Centrally and immediately below the tuning-dial escutcheon is the knob by which the set is tuned, and the local/distance switch, which is a welcome feature of the design, is mounted concentrically with this knob.

The tuning scale itself is calibrated in wavelengths, a feature which is of inestimable value for the identification of unknown distant stations.

To the right at the front of the instrument is the knob which controls a three-position wavechange switch giving medium waves, long waves, and with a central off position. The knob itself is clearly marked for position which, although perhaps only a small point, is but one of many ways in which the "252" gives evidence of considerable foresight in the design.

The remaining knob at the front is for

the purpose of controlling volume, and since it controls the setting of the reaction condenser, it will not require to be touched on any but weak distant stations.

The only other control at the front of the instrument is the small set-screw for the purpose of adjusting the loudspeaker, but since this is adjusted when the instrument leaves the factory, it is not likely to require attention in months.

Adjustable Tone.

At the back of the "252" there are several things of interest, not the least of which is the remarkably detailed instruction sheet affixed to the inside of the removable back. It tells you every possible thing you

heterodyne interference is bad. For that reason alone, even were it not for its other, and primary application, it is a most desirable feature.

Our practical tests with the "252" have been particularly illuminating and they have convinced us that at the price the instrument could not be bettered. Indeed, we are doubtful whether a better performance could be put up by any similar battery-operated receiver irrespective of price.

Selectivity is of a high order, and our tuning response curve measurements confirmed the impression that in this respect the "252" is decidedly above the average for sets of this type. These measurements were made with the local/distance switch in the distance position, and under these circumstances there is little doubt that the "252" would answer the requirements of a set for almost any Regional area.

Conditions, Good and Bad.

As for performance, even in the heart of London, and in the light of day—conditions as unfavourable for distant reception as it would be possible to find—the "252" gave an exceptionally good account of itself, and the strength of stations such as, for instance, the Northern Regional and Brussels, was all that could be desired.

Our later tests, conducted under very much more favourable conditions at our laboratories approximately 15 miles southwest of Brookmans Park, confirmed us in our belief that the "252" adequately fulfils the requirements of a really up-to-date S.G. three-valver.

As Good as the Best.

We found that it was possible to tune in literally dozens of distant stations on the ordinary broadcast band while the local stations were working, which in itself is a striking tribute both to the selectivity and sensitivity of this new Marconiphone production.

On the long waves, too, the high standard of performance was fully maintained. Huizen, Radio Paris, Daventry 5 X X, and Eiffel Tower, to mention a few of the better known stations, were all received at excellent strength on the loudspeaker.

As a result of our tests, we have no compunction in stating that the Marconiphone "252" is among the best of the three-valve battery-operated receivers that we have yet tested, and in our opinion it is worthy of serious consideration by all those who are interested in completely self-contained battery-operated models.

(Continued on next page.)

TECHNICAL SPECIFICATION

GENERAL DESCRIPTION.—Self-contained battery-operated receiver for use with external aerial arrangement.

NUMBER OF VALVES.—Three (screen-grid H.F., detector, and pentode output).

CONTROLS.—Centre knob, tuning control and concentric local/distance switch; left-hand knob, reaction control; right-hand knob, three-position wavechange switch with central off position.

SPECIAL FEATURES.—Local/distance switch; special tone balancer; ganged tuning, and ease of operation.

DIMENSIONS.—Height, 17½ in.; width, 15 in.; depth, 9¾ in.

PRICE.—£9 17s. 6d. complete.

MAKERS.—The Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1.

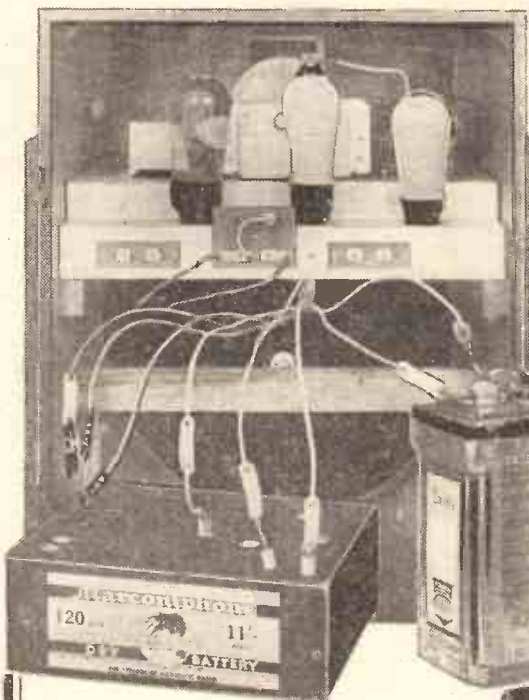
could want to know about the installation and maintenance of the set, and it includes a most useful and comprehensive fault-finding table.

It is at the back that provision is made for aerial and earth connections, for the use of an external loudspeaker and for a gramophone pick-up. Most outstanding of all, perhaps, is the simple plug and socket scheme which enables the tone of the loudspeaker to be altered to suit individual requirements.

Selectivity Tests.

An interesting aspect of this special tone balancer is that it goes a long way towards the elimination of that high-pitched whistle which is to be heard in districts where

THE MARCONIPHONE MODEL "252" — (continued from previous page.)

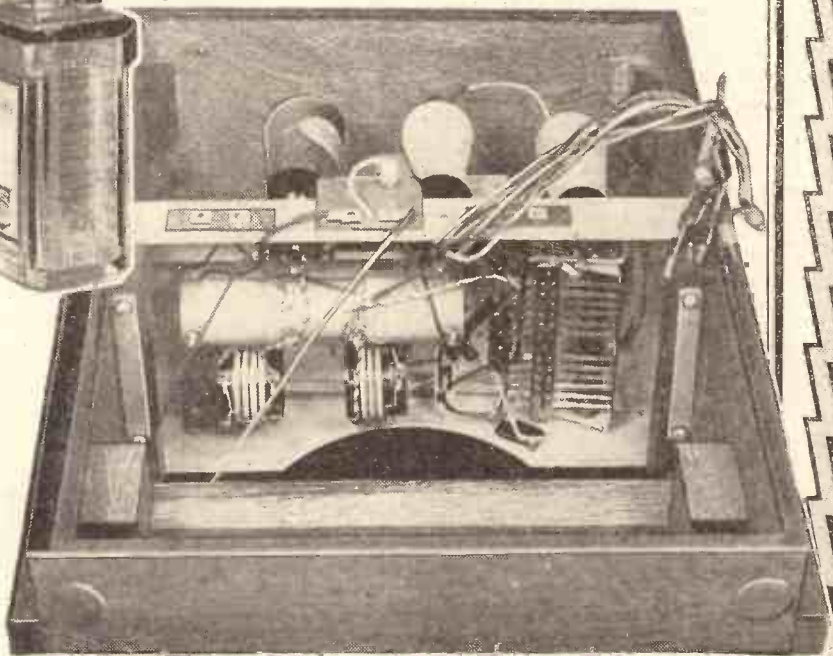


"TWO-FIVE-TWO" TOPICS

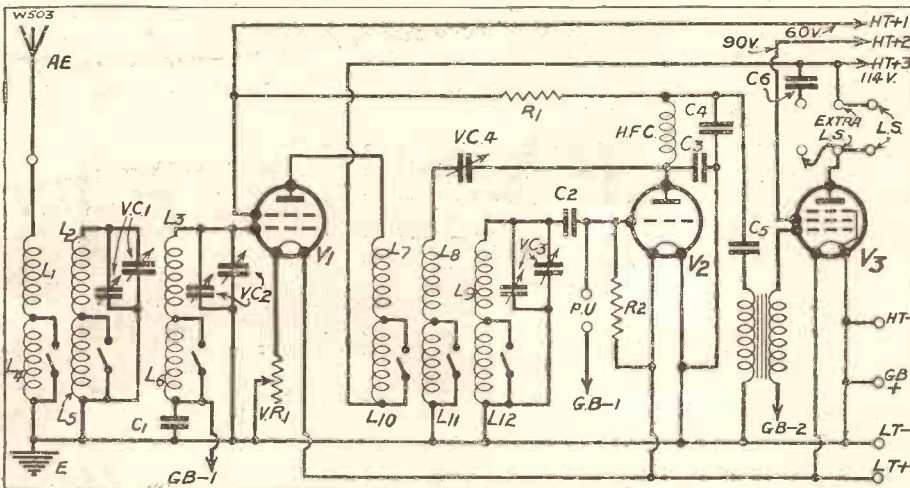
Provision is made at the rear of the "252" for the connection of a pick-up and an extra loudspeaker.

The tone-balancing scheme, which is mounted on the extra L.S. panel, is a most desirable feature, since it is very effective for eliminating heterodyne interference.

All the leads are clearly marked with ivory labels, and with the aid of the lucid instructions supplied, it is almost impossible to go wrong.



No, our photographer did not stand on his head to take the interesting picture on the right! But it does give an excellent idea of the high standard of workmanship to be found on the underside of the "252" chassis. The contacts of the ganged switch are clearly visible on the right, and the extremely low self-capacity of the switch consequent upon this particular method of construction is no doubt an important contributory factor to the outstanding success of the design. The picture above shows the "252" with the batteries connected up and ready for insertion into the cabinet.



The circuit of the "252" is based upon essentially modern principles, and the set which is built around it is one of which the Marconiphone Company can justly be proud. For reasons of simplification, and to enable you to get a better idea of the fundamental circuit, the ganged switching arrangements have purposely been omitted from this diagram.

EVERYTHING **G.E.C.** ELECTRICAL
your guarantee

LATEST DEVELOPMENTS



OSRAM 2-VOLT SCREEN-GRID BATTERY VALVES with the WEMBLEY FILAMENT

VS.2 (Metallized or Clear) PRICE 16/6

A new variable mu. valve with outstanding characteristics—long range, improved selectivity, adequate volume control, with only a 9-volt grid bias battery.

MUTUAL CONDUCTANCE 1.25 ma/volt at Ea 150, Esg 70, Eg. 0.
at Eg-9 0.05 ma/volt.

S.22 (Metallized or Clear) PRICE 16/6

The high slope screen grid valve to improve the reception of any three valve Kit set. Replace your old screen-grid valve with an OSRAM S.22.—A tonic to any set with single stage screen-grid.

MUTUAL CONDUCTANCE 1.75 ma/volt at Ea 150, Esg 75, Eg. 0.

S.21 (Metallized or Clear) PRICE 16/6

The screen-grid valve with new automatic OSRAM cushion springing and special non-microphonic construction. Designed for range with stability. A sensitive detector valve with entire absence of microphonics.

MUTUAL CONDUCTANCE 1.1 ma/volt at Ea 150, Esg 70, Eg. 0.

Osram Valves

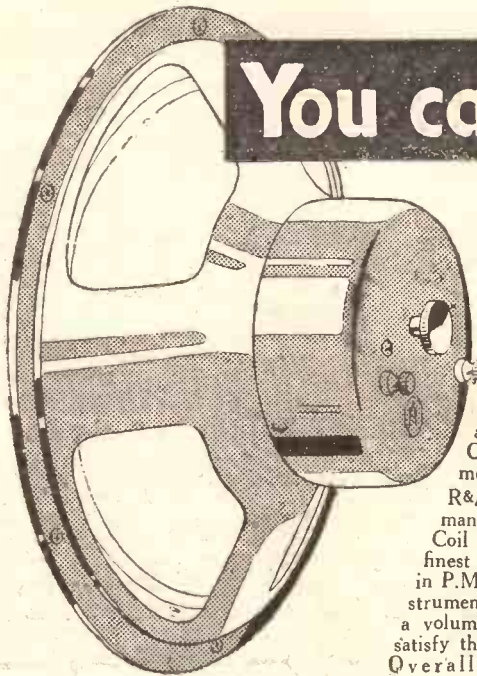
MADE IN ENGLAND
Sold by all Wireless Dealers

Write for the OSRAM Wireless Guide (1932 Edition) Sent Post Free on request.

EXTRA QUALITY WITHOUT EXTRA COST

OSRAM	
2-volt Valves with the WEMBLEY FILAMENT	
PRICES	
	PRICE
VS.2 Variable Mu. Screen Grid	16/6
S.22 High slope Screen Grid	16/6
S.21 Medium slope Screen Grid	16/6
H.2 High amplification Det. and RC.	7/6
HL.2 The non-microphonic Detector	7/6
LP.2 L.F. and Small Power	8/9
P.2 Super Power	12/6
PT.2 Economy Power Pentode	17/6

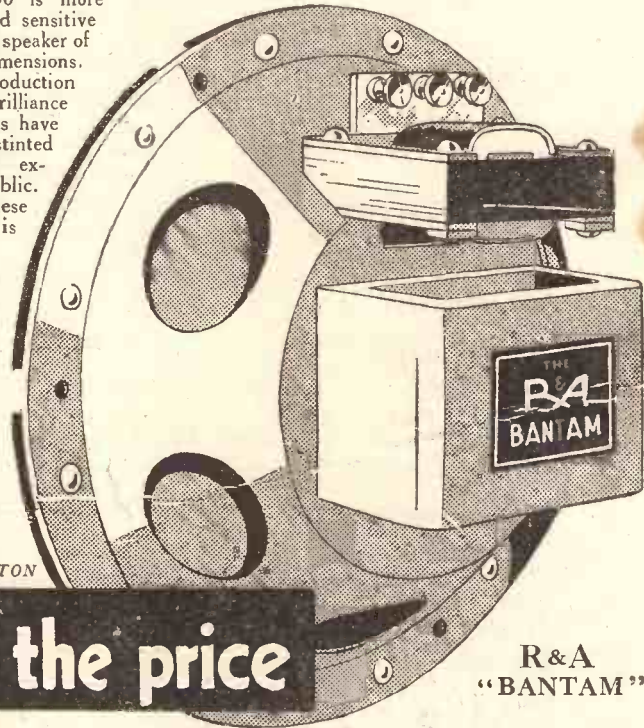
The OSRAM VS.2, S.22, S.21, H.2, HL.2 can be supplied either metallized or clear.



You can't get better VALUE

R&A Type 50 is more responsive and sensitive than any other speaker of its type and dimensions. The natural reproduction of speech and brilliance of musical passages have earned the unstinted praise of technical experts and general public. Notwithstanding these qualities, the price is amazingly low. Overall diameter, 10". **15/-**

R&A "Bantam" Permanent Magnet Moving Coil Reproducer is the finest value ever offered in P.M. Moving Coil instruments, and provides a volume and quality to satisfy the most critical. Overall diameter 7 1/2". Complete with 3-ratio Transformer. **27/6**



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Write for New Leaflet to REPRODUCERS & AMPLIFIERS, Ltd., WOLVERHAMPTON

or PERFORMANCE at the price

R&A "BANTAM"



"We're Fluxite and Solder, the reliable pair, Famous for soldering — known everywhere! Wherever there's Wireless — there you'll find us, We SOLDER ALL CONNECTIONS without any fuss!"

See that Fluxite and Solder are always by you—in the house, garage, workshop—anywhere where simple, speedy soldering is needed. They cost so little, but will make scores of everyday articles last years longer! For Pots, Pans, Silver and Brassware; RADIO; odd jobs in the garage—there's always something useful for Fluxite and Solder to do.

All Hardware and Ironmongery Stores sell Fluxite in tins, 8d., 1/4 and 2/8.

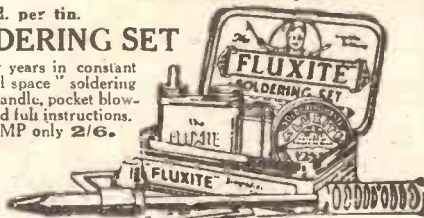
ANOTHER USE FOR FLUXITE Hardening Tools and Case Hardening. Ask for Leaflet on improved method.

NEW JUNIOR" SIZE 4d. per tin. FLUXITE SOLDERING SET

Simple to use and lasts for years in constant use. Contains special "small space" soldering iron with non-heating metal handle, pocket blow-lamp, Fluxite, Solder, etc., and full instructions. COMPLETE, 7 6s. or LAMP only 2/6.

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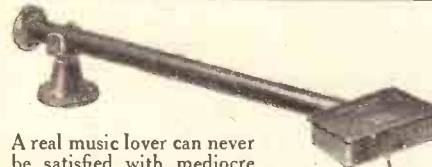


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FLUXITE

IT SIMPLIFIES ALL SOLDERING

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30/-

A real music lover can never be satisfied with mediocre reproduction of his favourite records, but this new Pick-up by Bowyer-Lowe has been designed to realise an ideal hitherto unattainable. Every delicate nuance, every inflection, every transient change in volume is as faithfully reproduced as though the actual players were in the room. In your own interest ask your dealer for a demonstration.

Send for Catalogue.

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DIAMOND WORKS, BRIGHTON.

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REDUCED TO **39/6** Carriage Paid!!!

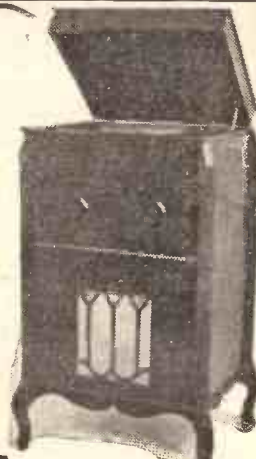
QUALITY GUARANTEED IMPROVED
Soundly constructed in selected oak, etc., and hand polished.

SPECIFICATION.—3'3" high, 1'10" wide, 1'6" deep. To take panels up to 18" x 7". Panel opening to suit set. These cabinets allow ample room for the following:— Pick-up, Motor, Speaker, Batteries, etc., all for the reduced price of 39/6.

Catalogue Post Free. From one of the Largest Mail Order Works in England.

W. S. WILKIN, Cabinet Manufacturer,
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After eight years' service

to true radio reproduction, the **FERRANTI AF3 TRANSFORMER** remains still without any equivalent at its price . . . and in the identical form which so upset all existing conceptions in transformer amplification in 1924.

A Good Transformer must give not only uniform amplification in the laboratory but also in the set—to-day, to-morrow; year in, year out.

Ferranti Transformers have proved this characteristic—their freedom from breakdown is a by-word amongst Radio Engineers and Constructors all over the world.

The reproduction of your set will be greatly improved if you fit an AF3 . . . (unless you are already using an AF5).

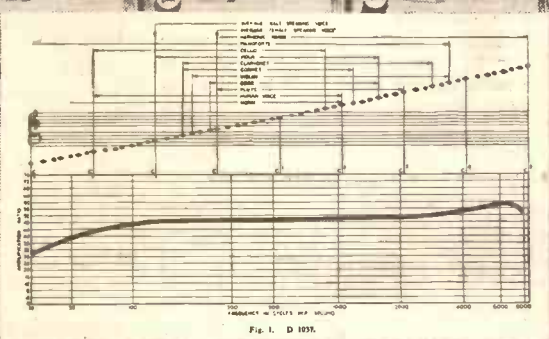
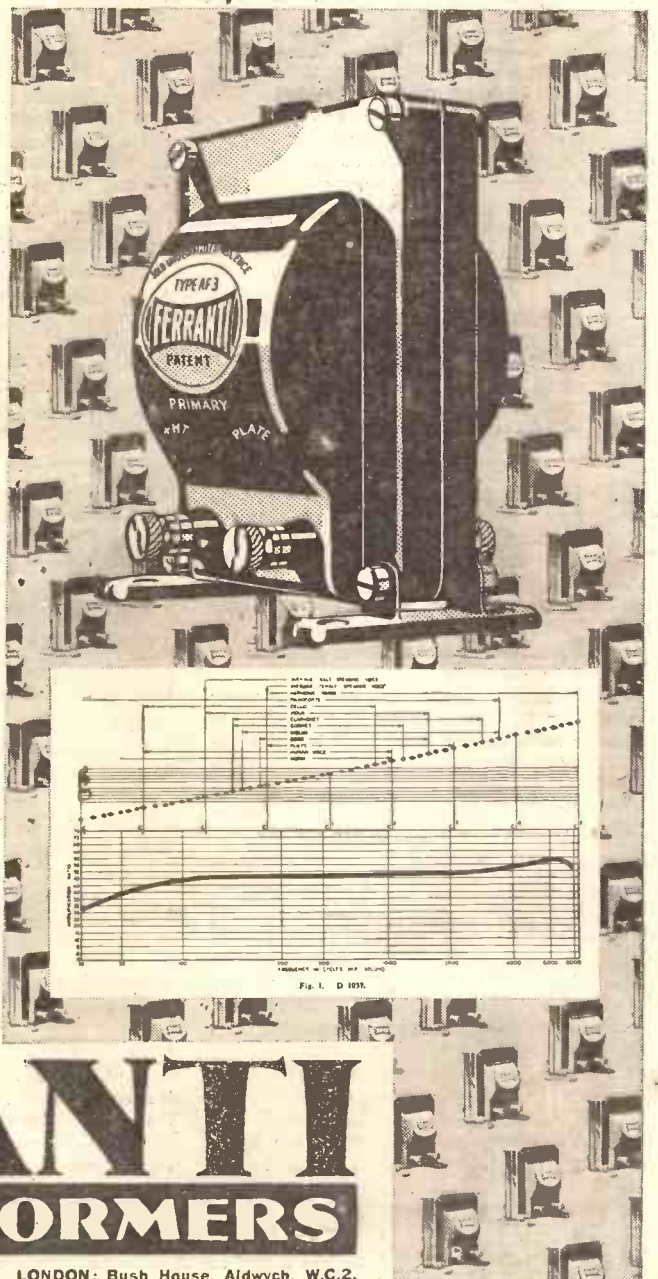
PRICE 25/- Ratio - - - 1/3.5
Inductance 220/75 henrys
0.5 milliamp.

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AF3 TRANSFORMERS

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Every Ferranti Transformer is guaranteed to give a performance within 5% of the published curve, AND within 5% of every other Ferranti Transformer of the same type. Ferranti are the only transformers so guaranteed.



EVERY now and then I devote these notes to a description of an hour or two spent with the wireless set on the evening before they are written, for this is, I think, one of the best ways of giving readers an idea of current long-distance reception conditions.

The set in use, by the way, is a commercial one, battery operated. It contains two screen-grid H.F. valves, detector and small-power-valve output. It is used in conjunction with an indoor aerial of moderate size.

Received In Daylight.

During the afternoon long-wave stations were coming in well, and quite a number were to be heard within the limits of the medium waveband, including Brussels No. 1 and No. 2, Langenberg, Rome, the Poste Parisien, Breslau, Hilversum, and Turin—not a bad bag in daylight.

Though in point of fact conditions during the evening were not quite so good as they had been on several previous nights, an astonishing number of stations was received at full loudspeaker volume.

The long waveband produced good reception from Kalundborg, Moscow, Motala, Warsaw, Zeesen, Radio-Paris and Huizen. Both the Eiffel Tower and Oslo were unfortunately so badly heterodyned as to be useless. The Vienna Experimental station was heard at fair strength.

As one worked upwards from near the bottom of the medium waveband the set



Realising the importance of providing listeners with up-to-the-minute news about long-distance stations and conditions, "P.W." publishes every week the notes of a Special Correspondent who nightly searches the ether in order to provide a log that is really up-to-date.

showed at once that there was that liveliness which is always so pleasant.

Nothing of note was recorded until Nürnberg was reached on 239 metres, since the Swedish, French and Belgian wanderers are still—wandering! The impression that you get of the waveband between 200 and 239 metres is that it is one jumbled mass of heterodyne squeals and mush. The latter is probably due to the harmonics of long-wave commercial stations.

Above 239 metres things brightened up at once. Trieste was good to begin with, but became slightly muzzy later on when some tiny station, who might have been a thousand miles away from him, came into action. The volume obtainable from Trieste is simply colossal.

Near the National.

Next came Toulouse PTT and Horby, both quite first-rate. In order to receive Leipzig and Moravska-Ostrava, which have the channels immediately below and above that of the London National, it was necessary to use the smallest aerial tapping and a considerable reduction in strength consequently occurred. Both of these

stations, though, are very much there when the London National is not at work.

Turin, Heilsberg and Bratislava were all picked up, the last being not quite so good as the other two. For some reason I can never make much of Copenhagen on 281 metres, though other listeners have

often a different story to tell. Fortunately his programmes are always to be received from Kalundborg.

They Speak for Themselves.

Hilversum was, of course, immense, and Bordeaux Lafayette gave fine volume. Above this station there was a fairly large interval before I came to the next good station, Göteborg on 322 metres. Breslau and the Poste Parisien immediately above him literally speak for themselves!

Milan was easily receivable, but this set would not bring in Poznan, though the station was found reasonably good when a super-heterodyne was tried a little later.

Brussels No. 2, Brno and Strasbourg left little to be desired. Barcelona was not at his best and the next station well received was Hamburg. Toulouse was strong, though his quality was not of the best.

Frankfurt came in well, as did Sottens and Katowice. Between 404 and 550 metres the stations logged at good loudspeaker strength were Stockholm, Rome, Langenberg, Prague, Florence, Brussels No. 1, Vienna and Budapest.

FOR this week's notes I shall have to rely mainly upon correspondence, as my long-overdue holiday has been occupying my time, and this time I resolutely declined to take anything pertaining to radio with me. Incidentally, I was rather sorry about this resolution, for the Clerk of the Weather repaid me with several days of continuous drizzle.

But when one soaks oneself in short-wave work for fifty-one weeks of the year, it simply *must* do one good to forget it completely for a few days of the remaining week, and I confess that other occupations completely succeeding in crowding short-waves from my mind for at least three days.

"My S.G. Four."

On returning, the first business was to open the pile of envelopes awaiting me; the second was to pick out those letters that were written in legible writing; and the third to think of an interpreter for the remainder. The latter person has not yet materialised, and we must confine ourselves to the legible ones.

First come some twenty logs of broadcast stations, but none of them equals that of W. W. (Exeter), who certainly holds the "P.W." record as yet. Then there is an inquiry from M. C. K. (Laxey), as to

SHORT-WAVE NOTES



News and views regarding an exciting and fascinating waveband.

By W. L. S.

whether the "S.G. Four" is likely to be superseded by a more modern short-wave Four.

The answer to that, M. C. K., is that I have tried out several "fours" lately, but can't get anything better out of them than I did from the original "S.G. Four," of which I was very proud! I should advise you to carry on with it.

Back to Earth!

M. C. K.'s letter concludes thuswise: "But I must get back to 'earth,' and stop this 'hand capacity' for writing. 'Resistance' is a great 'choke' on the 'high-frequencies' of the mind!"

E. J. S. (Birmingham) sends me some Morse to decipher. The "text" is "de PLL," which means that you heard the tail end of a call by a Dutch station. Unfortunately, PLL is not in my latest list, so that I am afraid I cannot give you the exact frequency.

All the Calls.

The full list, E. J. S., appears in the Amateur Call-Book. [All broadcast stations and all fixed-wave commercials, whether telephony or C.W., are listed in this valuable publication.

The same answer applies to R. M. C. (Tilshead), with the additional remark that the Call-Book may be obtained from the R.S.G.B. or from Mr. F. T. Carter, Flat A, Gleneagle Mansions, Streatham, London, S.W. R. M. C. wants information about a French station on about 235 metres. From his description, the station sounds like an amateur, but he had no business using *that* wave if he were!

I don't like your tuning arrangement, R. M. C., to be perfectly candid, and I should be inclined to use a .0001 fixed condenser in series with your .00025 tuning condenser. That will upset the wave-ranges, but I think you will cover them all just the same.

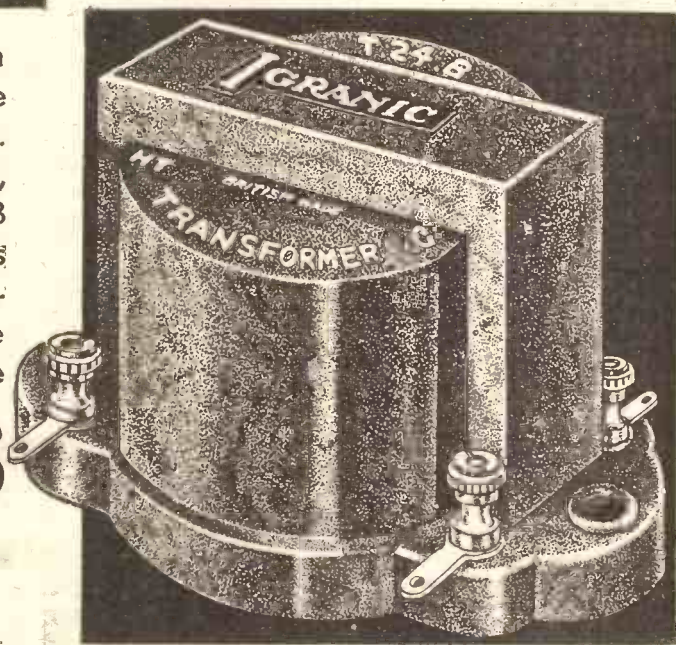


IGRANIC QUALITY COMPONENTS

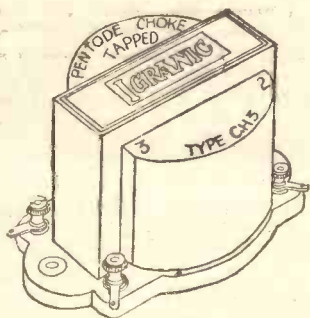
The quality of your reproduction depends upon the quality of your components. You can be certain of both if you use Igranic components. Nothing is left to chance in the designing, construction and finishing of this Igranic T.24B Transformer. The primary inductance of this transformer is high, permitting a high amplification of bass notes, whilst at the same time reproducing faithfully all notes over the whole scale of musical frequencies.

Supplied in two ratios 3:1 and 5:1

Price **5/6**



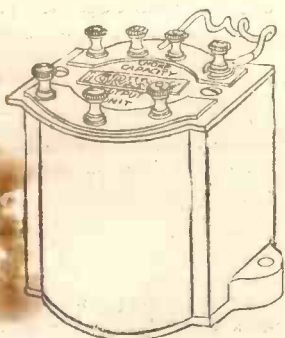
**IGRANIC
COMPONENTS WILL
BE THE MAKING
OF YOUR SET.**



PENTODE TAPPED CHOKE

The Igranic Pentode Choke is designed so that the impedance of various types of loud-speakers may be matched to that of the pentode valves whilst keeping the inherent self capacity of the choke at a minimum.

Price **10/6**



TAPPED "C.C." OUTPUT UNIT

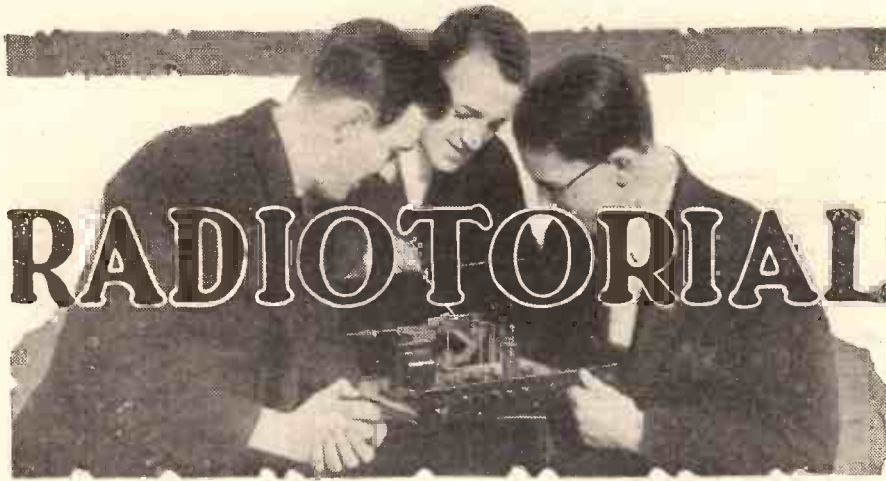
Invaluable for receivers employing a power output valve. It prevents de-magnetisation and makes possible a closer adjustment of loud-speaker movement. Designed to pass a maximum current of 30 milliamps.

Price **12/6**

Write to-day for fully illustrated Catalogue No. 190 of complete new range of Igranic Quality Components. Igranic Electric Co., Ltd., 149 Queen Victoria St., E.C.4.

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RADIOTORIAL

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All enquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

H.F. INSTABILITY DUE TO LOUDSPEAKER LEADS.

"PLATO" (Taunton).—"Owing to severe and prolonged illness in the house I had to alter my loudspeaker arrangements which,

previously satisfactory, are now giving trouble. It appears that the long lead, now necessary, causes a peculiar distortion effect, very unpleasant to listen to. And this vanishes directly the long lead is cut out.

"But as this is the lead I want most I tried shifting it as far as possible, without much effect, until it was suggested that I try an H.F. choke between the output terminal of the set (the one that is connected to plate) and the long lead to speaker.

"This has improved matters, but the trouble is still there to some extent. Is there any more I can do? (Chokes in other leads seem to have little or no effect.)"

You do not say if the output valve has an H.F. by-passing condenser connected between plate and filament, but if not a .001 mfd. of good quality here should do a lot of good.

If, however, there is such a condenser, try another H.F. choke in series with the one now inserted, and possibly another .001 mfd. (or thereabouts) connected between the junction of the chokes and "earth." This should remove any lingering traces of the trouble.

VARIATIONS IN MAINS VOLTAGE.

"AIRPORT" (Croydon).—"Some six or seven months ago an electrician friend of mine who does a lot of motoring afforded me a sort of

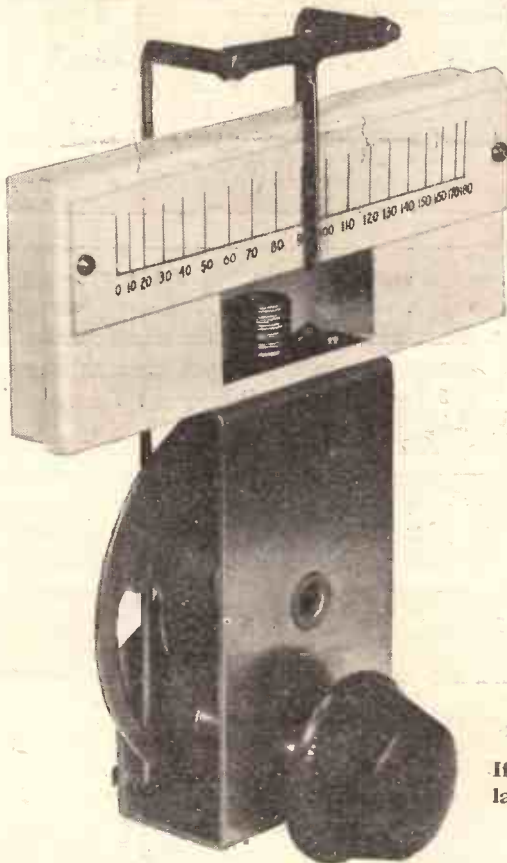
(Continued on page 236.)

DO YOU KNOW—

The Answers to the following Questions?

There is no "catch" in them, they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

- (1) Who was the B.B.C.'s first popular "Uncle"?
- (2) Which has the greater reactance (or impedance)—a large- or a small-capacity condenser?
- (3) Under Germany's present political régime, which of her broadcasting stations can be regarded as the official one?



Now. STRAIGHT LINE reading!

Obviously the most sensible method of tuning a set was to have a complete tuning scale before your eyes all the time, and now Utility have produced a Straight-Line Dial which renders obsolete and old-fashioned every other method.

In this new dial the whole of the scale is fixed and exposed to view, the pointer being movable and travelling across the scale in a horizontal line. The scale is illuminated and easily removed for individual calibration.

Ask your dealer to show you these new dials and you will be so impressed that we know you will fit them right away.

PRICE

complete with escutcheon

7'6

If fitted with front lamp extraction, 6d. extra.

From your dealer, or Post free from the Makers—

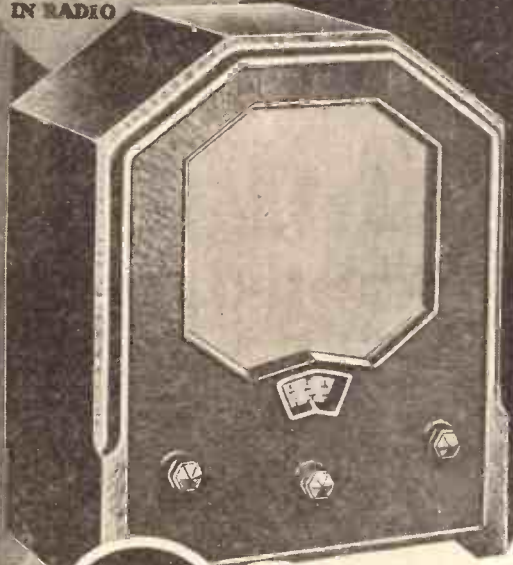
WILKINS & WRIGHT LIMITED,
Utility Works, Holyhead Road, Birmingham.

AGENTS.—London: E. R. Morton, Ltd., 22, Bartlett's Buildings, Holborn Circus, E.C.4; Scottish: E. B. Hammond, 113, Vincent Street, Glasgow; Lancashire and Cheshire: J. R. Lister, 93, Old Road, Blackley, Manchester; Westmorland, Cumberland, Durham, Northumberland, Yorkshire, and Derbyshire: H. C. Rawson, Ltd., 100, London Road, Sheffield; South Western: Lawrence Fraser, Chelsea House, Lansdown Road, Bath.



**G.E.C.
Radio**
SUPREMACY
IN RADIO

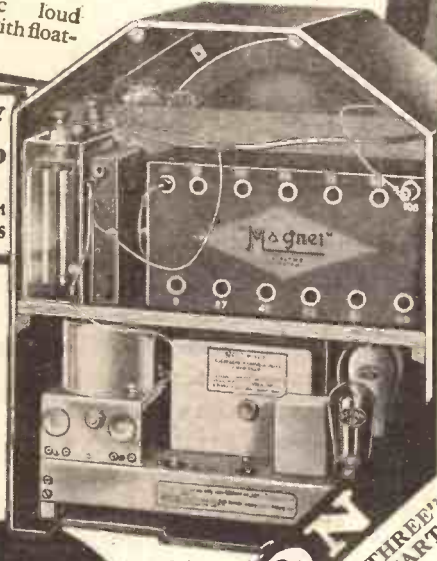
Sweeping the Country WITH BETTER, CHEAPER, SIMPLER RADIO



Osram THIRTY-THREE MUSIC MAGNET

- SPECIAL FEATURES**
- 1 A complete table model receiver with built-in loud speaker.
 - 2 Batteries housed inside cabinet—no external battery connections.
 - 3 Two metallised OSRAM screen-grid valves and latest type OSRAM power output valve.
 - 4 Screen-grid detector gives great sensitivity.
 - 5 Tuning by one knob only.
 - 6 New magnetic loud speaker chassis with floating cone ensures highest quality reproduction.
 - 7 Unit assemblies make home construction the essence of simplicity.
 - 8 Latest OSRAM valves (battery type) with the Wembley filament.
 - 9 Handsome one-piece cabinet in moulded Bakelite—walnut graining.

**ENTIRELY
SELF-
CONTAINED**
Ample
accommodation
for Batteries



In every part of the country people are buying the OSRAM "THIRTY-THREE." The public has been quick to appreciate its fine qualities. This amazing kit set is a piece of sound engineering construction which gives the most reliable radio performance. Its popularity is largely due to the designers' insistence that, like all OSRAM MUSIC MAGNETS, this latest model should be built up to a standard and not down to a price. Two screen-grid and power output OSRAM VALVES. Read carefully the nine special features. These are convincing.

WRITE for the OSRAM "THIRTY-THREE" Constructor's Instruction Chart. It is crammed full of useful hints and tips. The clear instructions will convince you that this is the world's best circuit and assembly kit.

HIRER PURCHASE
Deposit of 2/- and 12 monthly payments of 15/-
MADE IN ENGLAND
Sold by all Wireless Dealers

PRICE
9 GNS.
Including cabinet, built-in loudspeaker and OSRAM VALVES

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Please send me the OSRAM "THIRTY-THREE" MUSIC MAGNET INSTRUCTION CHART

Name _____ Address _____

The General Electric Co. Ltd.,
Magnet House,
Kingsway,
London,
W.C.2

P.W.



**A SIMPLE STEP
FROM CHART TO SET**

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

Cut out and paste on postcard, or enclose in unsealed envelope, Halfpenny postage in either case.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 234.)

motoring holiday by taking me along with him to various parts of the country round London.

"His job entailed the use of some elaborate testing apparatus, including an expensive voltmeter for A.C. We naturally talked about his experiences, at times, and I was surprised to learn that there are often quite large variations in mains voltages, which must, I should think, affect wireless people using them to a considerable extent.

In one case, I remember particularly, he checked up an alteration of 12 volts on A.C. mains, this occurring during a visit of less

HOW IS YOUR SET GOING NOW ?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly? Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scales of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4. A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS. PLEASE NOTE: Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

"P.W." PANEL No. 92.—BERLIN—WITZLEBEN.

The "Witzleben" station is Berlin's "Regional," working on 419.5 metres, with a power of 1.5 Kw.

The call is "Achtung! Berlin," but the name of the long-wave station at "Königs Wusterhausen" is frequently given when the programme is relayed from there.

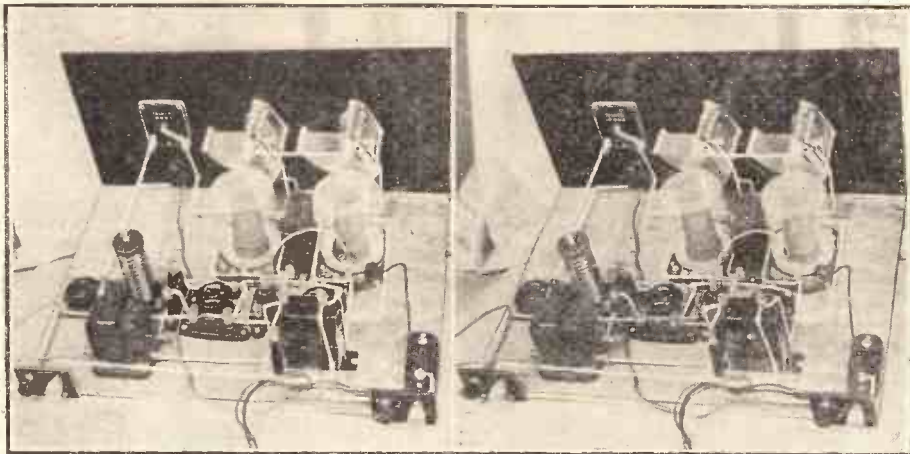
Distance from London, 579 miles. Closes down with "Deutschland Uber Alles," (the hymn-tune "Austria," by Haydn).

than a couple of hours. Not owning a mains set myself, at the time, I did not press for further particulars (and now it is impossible), but now I look back and remember that, I am made nervous about my newly-fitted A.C. valves!

"There must be a snag somewhere, I suppose, as these take only 4 volts and a variation of only 1 or 2 volts would presumably do them in. What I should like to know, however, is why 4-volt filaments can be run

(Continued on page 238.)

A TRUE-VIEW NEW VIEW OF THE "APEX"



Seen stereoscopically through the true-viewer we described last week, or through a commercial stereoscope, this "Apex" seems almost to leap from the page. Our artist has also arranged that the coils are visible inside their screens

A TRIUMPH OF PRECISION

● Gives extremely fine tuning. Similar in construction to the "NUGANG" Condensers, but the trimmer of front section is operated independently from the receiver panel by means of a second knob concentric with the main tuning knob. Rigid one-piece chassis, very robust construction. Trimmer to each stage. Heavy gauge wide spaced aluminium vanes. Special bearings to rotor ensure permanent accuracy. Capacity 0005. Matched to within 1/2 mmfd. plus 1/2 per cent. Complete with disc drive and bakelite escutcheon plate.

2 gang - 18/6 3 gang - 27/-



J.B. UNITUNE

PRECISION INSTRUMENTS

Write for new Catalogue.

Advertisement of Jackson Bros., 72, St. Thomas' Street, London, S.E.1.

A NEW EKCO SET!

The Greatest of all new 3-valve Receivers

Ten Dominating Features

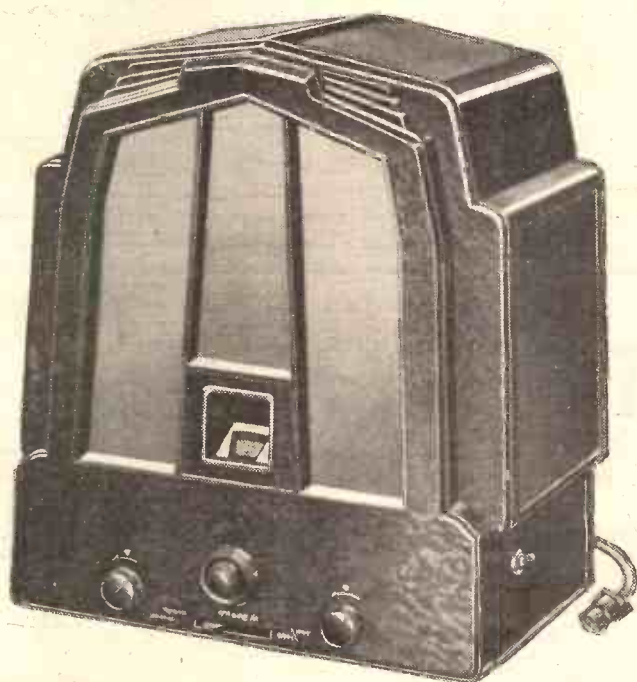
- 1 Latest type of three-valve circuit (Screened Grid, Detector and Pentode).
- 2 Wide choice of stations from home and abroad at full loud-speaker strength.
- 3 Can be used without aerial or earth if desired.
- 4 Simplicity itself—single knob tuning with illuminated dial calibrated in wavelengths.
- 5 Latest type moving-coil speaker.
- 6 Selectivity and volume control.
- 7 Connections for gramophone pick-up and additional speaker.
- 8 Figured walnut bakelite cabinet.
- 9 Westinghouse Metal Rectifier in A.C. Model.*
- 10 All-electric—just plug in to your electric supply and switch on—that's all.

*THE NUMBER OF VALVES stated in descriptions of EKCO receivers signifies the actual number of RADIO RECEIVING STAGES. Rectifying stages in A.C. models are not included. With one exception, all EKCO receivers, etc., employ the Westinghouse patent Metal Rectifier, which is of a definitely permanent character.

"... a performance above any other of its class... astounding results are obtained" **Evening Standard**

"On Thursday I received 13 and on Friday 19 American Stations" **F. W. Emerson, Bury St. Edmonds**

Many other testimonials prove that experts, press and public, consider the M.23 the very finest of its kind.



MODEL

M.23 PRICE **17 GNS.**

or 12 monthly payments of 32/9
For A.C. or D.C. Mains



To E. K. COLE, Ltd., Dept. A22, EKCO Works, Southend-on-Sea.
Please send me full details of EKCO Power Units, Consoles, Consolettes and Radio-Grams.

Name.....
Address.....

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 236.)

successfully from mains which themselves vary in volts more than that figure?"

When a mains voltage is "stepped-down" from a high to a low value—say from 240 volts to 4 volts—the transformer has the effect of "stepping down" any unwanted voltage variations also.

To put it in another way, the transformer keeps the unwanted variation as a percentage of the total voltage.

Suppose, for instance that a certain 240-volt mains sometimes varied 10 volts on the mean value of 240. This represents a ratio of 10:240=about 4 per cent. When "stepped" down to 4 volts, the variation would still appear, but it would still be only a 4 per cent variation of the total. As 4 per cent of 4 volts is somewhere about .16 volts, the effect of the 10-volt variation would become only about 1/16th of a volt at the "filament" transformer.

REMOVING HUM.

G. C. B. (Hastings).—At first my conversion to A.C. valves looked like being a 'short-lived' experience, on account of a strident hum. But faulty eliminator smoothing was partly the cause of this and a better L.F. choke stopped it.

Then we moved, and it was almost as bad as before, every time the set was tuned-in, until I saw the tip about connecting two high-test-voltage fixed condensers across the mains, and earthing the centre point. This I did, using '1's, one to one side of the A.C. transformer, one to the other, and the junction to the earthed case.

"It was very successful, but there is still enough hum left to be troublesome, and altering the value of

the two condensers does not seem to remove this. So I thought I would try an H.F. mains choke as well.

"Where should this be connected—or do I need more than one?"

It is certainly worth trying the effect of H.F. choking. Probably two chokes will be needed, one in each of the leads from the mains to the transformer primary.

Be sure to get the proper, heavy-duty mains type of H.F. choke, designed for such a purpose. Ordinary H.F. chokes are not suitable.

THE FOUR-VALVE COSMIC.

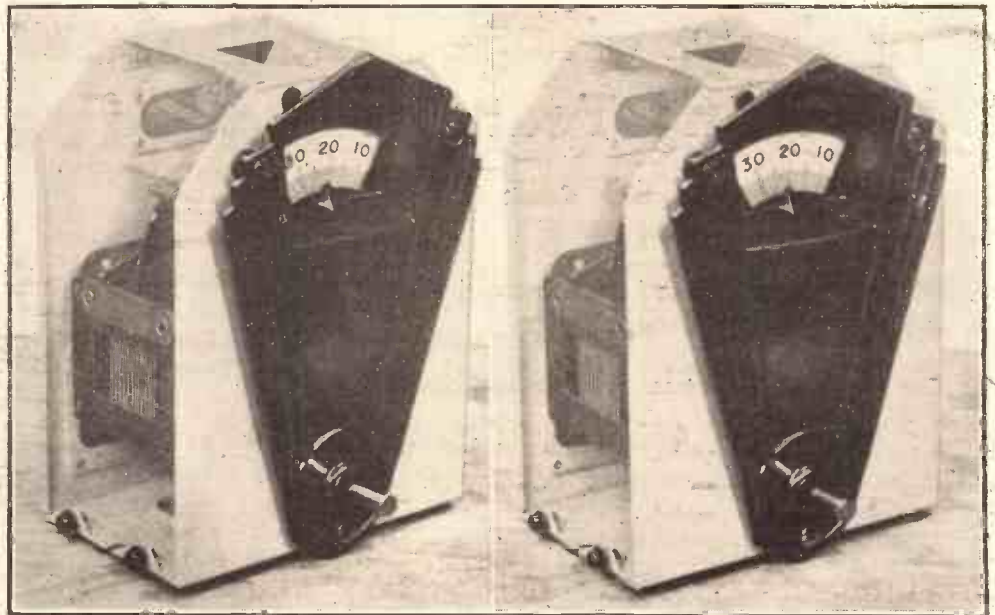
Many readers have made inquiries as to when the 4-valve version of the "Cosmic" appeared in print. The following are the articles concerned and their dates of publication:

The "Cosmic" Four, "P.W." No. 529.

The Construction of the "Cosmic" Four, "P.W." No. 530.

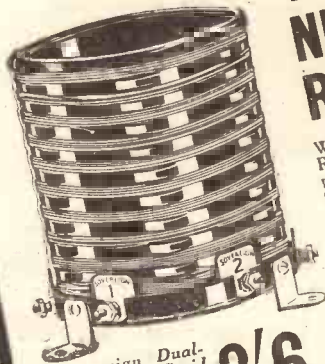
Both these numbers of "P.W." are needed when building the receiver.

SEE IT STAND OUT SOLIDLY



When looked at through a true-viewer, this Telexor appears to be quite solid enough to tune!

FREE BLUEPRINT WITH THIS NEW DUAL-RANGE COIL



Sovereign Dual-Range Coil (Type W.S.) with free blueprint **3/6**

With every Sovereign Dual-Range Coil, Type W.S., a Blueprint is given (free) showing how to build the Sovereign "Viceroy" and Sovereign "Ambassador" Sets. This wonderful coil is made to an extremely high level of efficiency, functioning perfectly on both wave-bands. It is accurately wound on bakelite with numbered terminals and mounting lugs on the base, and can be thoroughly recommended wherever a Dual-Range Coil is used. Let us know if your dealer cannot supply.

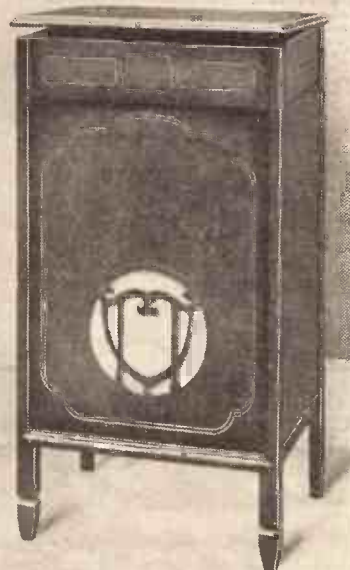
If you wish we will send you the Sovereign Blueprint (Free) together with Catalogue on receipt of your name and address.



Readers of "Popular Wireless" should make certain they know about the complete range of Sovereign Products—long famous for their quality and low prices. A postcard to us with your name and address (Dept. P.W.10), will bring you a free copy of the Sovereign 1933 Components Catalogue and Blueprint. Do as the experts do—use Sovereign wherever you can.

SOVEREIGN PRODUCTS, LTD. SOVEREIGN HOUSE, ROSEBERY AVENUE, E.C.1.

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if you want to convert your Set into a modern RADIO-GRAM only **75/- complete**

The Camco "Popular" Cabinet for housing a modern Radio-Gram. Designed on sound acoustical lines and finished in handsome shaded walnut, it is an extremely attractive Cabinet. Includes motor-board, shelf, baffleboard and automatic stay with ample room for Batteries and Eliminator—only 75/- complete.

Only one of the many attractive Cabinets from the new Camco range. Call in at our showrooms and inspect these handsome Cabinets. Open 9.15 a.m. to 5.45 p.m. (Sat. 12.30). In any case, don't forget to send coupon for your FREE copy of the new Camco Cabinet Catalogue.

Post in 1d. envelope.
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Phone: HOLLborn 8202.
Works: S. Croydon.



CABINETS

NAME.....
ADDRESS.....
.....5 P.W.

Direct Radio

**159
BORO
HIGH
STREET
LONDON
BRIDGE**

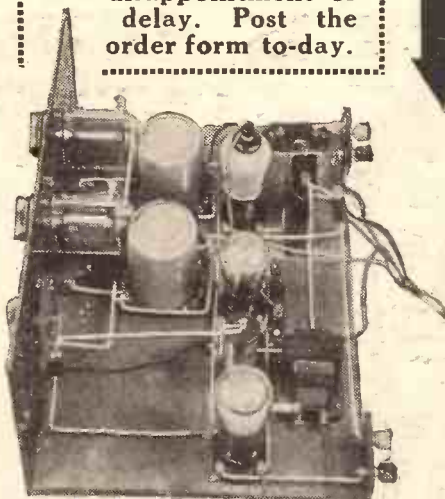
The "APEX"

**INSIST ON HAVING THE
DIRECT RADIO PRIZE WINNING
GUARANTEED "APEX" KIT**



The APEX "159" CABINET

"Direct Radio" have huge stocks of Kits and Accessories for dispatch to you at once. Do not risk disappointment or delay. Post the order form to-day.



Run no risks—Build Better with "Direct Radio"

CASH C.O.D. EASY PAYMENTS

£ s. d.		£ s. d.					
1	Permcoll Panel, 14 ins. x 7 ins.	4	0	2	Ormond .0005-mfd. s.m. variable condensers No. 6	13	0
2	Colvern Screened coils, type T.D.	17	0	1	2-meg. Grid Leak, wire ends	10	0
1	Ready Radio 10003-mfd. solid dielectric reaction condenser	2	3	1	Dubilier 30,000-ohm resistance, wire ends, 1 watt.	1	0
1	Ready Radio 3-pt. wave-change switch	1	6	1	Dubilier 200,000-ohm resistance, 1 watt.	1	0
1	Ready Radio 2-pt. wave-change switch	10	0	1	Ready Radio H.F. Choke	1	6
1	Bulgin on-off switch. Snap type S.80	1	6	1	R.I. L.F. Transformer. Dux	6	9
3	Valve holders	1	6	4	Belling & Lee indicating terminals	10	0
1	T.C.C. .0003 - mfd. fixed condenser "S"	1	3	2	Terminal strips	1	0
1	T.C.C. .0002 - mfd. fixed condenser "S"	1	3	1	Coil Glazite	6	0
1	T.C.C. .0001 - mfd. fixed condenser "S"	1	3	1	Belling & Lee 5-way battery cord	2	0
1	T.C.C. 2-mfd. condenser	3	10	1	Piece Copper foil, 10 ins. x 5 1/2 ins. Plugs, screws, etc.	1	0
1	T.C.C. 1-mfd. condenser	2	10	3	Mullard valves, PM12A, PM1HL, PM2A	1	12
				1	Blue Print Free	1	12
						£5:1:3	

KIT No. 1 (Less Valves and Cabinet) **£3.9.0**
or 10 equal monthly payments of **7/6**

KIT No. 2 (With Valves less Cabinet) **£5.1.3**
or 12 equal monthly payments of **9/6**

KIT No. 3 (With Valves and Cabinet) **£5.18.0**
or 12 equal monthly payments of **11/-**

KIT No. 4
Complete with "159" Walnut Consolette Cabinet, Siemens Batteries, Oldham Accumulator, Epoch Twentieth Century Moving Coil Speaker. **£9.10.6**
or 12 equal monthly payments of **17/6**

"APEX" ACCESSORIES

- SIEMENS 120-volts H.T. Battery 13/6
- " 9 volts G.B. Battery 1/-
- OLDHAM 0.50 L.T. Accumulator 9/-
- EPOCH Twentieth Century Moving Coil Speaker chassis 35/-
- or in Epoch Oak Cabinet £2-7-6
- ATLAS A.C. 244 H.T. Unit £2-19-6
- ALTA A.K. 260 H.T. Unit £4-10-0
- With trickle charger.
- R & A Type 50 magnetic type speaker chassis 16/6
- GRAHAM FARISH Filt Earth 2/6

CASH, C.O.D. AND EASY PAYMENT ORDER FORM

To : Direct Radio Ltd., 159, Borough High Street, London, S.E.1

Please dispatch to me at once the following goods.....

(a) I enclose
for which (b) I will pay on delivery {Cross out line}
(c) I enclose first deposit of {not applicable} £.....

NAME.....

ADDRESS..... P.W.8/10/32

ANY COMPONENT CAN BE SUPPLIED SEPARATELY

You can of course buy your favourite accessories direct from Direct Radio. Write us for lowest quotations and suggestions.

TRADE JOTTINGS

By G. T. KELSEY.

I UNDERSTAND from Messrs. Standard Telephones & Cables, Ltd., that a certain amount of confusion exists concerning the address of their Radio Merchandise Department. Will "P.W." readers kindly note that all matters connected with the radio products of this firm, i.e. sets, valves, loudspeakers, etc., should be addressed to St. Chad's Place, 364, Gray's Inn Road, London, W.C.1?

New Variable-mu.

Readers will be interested to learn that a new "variable-mu" valve for 2-volt battery operation has just been produced in the Osram range.

This new valve, to be known as the Osram V.S.2, is fitted with the famous Osram "Wembley" filament, and it is claimed that, on account of the increased efficiency of this type of filament, a high value of mutual conductance is possible purely by utilisation of the electronic stream, and not by a reduction in electrode clearances.

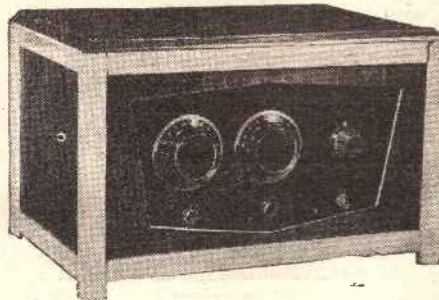
For the Short Waves.

I am glad to notice that a model of the Antinodal Short-Wave Converter, which R.I.'s seem to have been scoring such a hit with (and, may I add, deservedly so?), is now available for use in conjunction with any A.C. mains-operated set.

As one would expect, when R.I. tackle a job like this, they tackle it in a really first-class manner, and this latest model of theirs for instantly converting any A.C. receiver into a hot-stuff short-waver is the naggiest thing I have seen for a long while.

The part that I like about it is that it incorporates its own mains equipment, and, in consequence, it can be fixed to an existing set without removing any valves and without even lifting the lid. What could be more simple—and, equally important, more safe—than this Radio Instruments scheme?

AN "APEX" CABINET



This is the new cabinet introduced by Direct Radio, Ltd., specially for the P.W. "Apex."

A new "159" type of cabinet has been brought out by Messrs. Direct Radio. This is of particularly neat, modern design in hand-polished walnut, and the "Apex" receiver looks very handsome indeed in it.

Although such a great improvement on the old style of American cabinets we know so well, the prices have not been increased.

Calculating Resistances.

The modern tendency to make catalogues, leaflets, etc., of interest, apart from the primary one of supplying information concerning the firm in question's products, is well exemplified in a leaflet that has just reached me from the Watmel Wireless Co., Ltd.

This new Watmel leaflet tells you all about a fine range of resistances and potentiometers, and for that reason alone it is well worth having. But, over and above that, the front page is devoted to a most useful chart for the calculation of resistance problems.

It enables you to tell in an instant voltage drop and power in watts, given the resistance and current ratings, and it can be twisted round to tell its owner almost anything about resistance problems in general.

A copy of this useful leaflet—free, of course—can be obtained on application to the Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex.

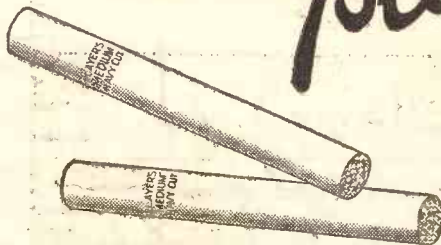
AN ADVERTISER'S CORRECTION.

In the Bowyer-Lowe advt. which appeared in our September 24th issue, the price of their A.E.D. Volume Control appeared as 18s. 6d. We are informed this should have been 8s. 6d. Will readers kindly note?

**THE MILLIONS WHO
SMOKE THEM
MUST BE RIGHT**

They say

*Player's
Please*



The Quality and Quantity Cigarette

NCC 104 B

**Be Bright at
Breakfast
time**



**PARKE-DAVIS
Shaving Cream**

A comfortable shave means a good start to the day. If you find shaving a bore in the morning, give Parke-Davis Shaving Cream a trial. It really does soften the beard quickly and effectively, and yet protects the skin from irritation. The liberal seven-shave tube which we offer you free will prove it. Use the coupon and confirm our claims. Large tube 1/6. From all Chemists.

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Dept. 125C 50 Beak Street, London, W.1
Please send FREE sample tube Shaving Cream.

Name

Address

(Use block letters please)

POST THIS COUPON NOW



WHAT I SAW AT MANCHESTER

(Continued from page 194.)

sented at the City Hall, but the proof of the show is in the seeing, and mere words can give only the skimpiest impression of this wonderful hall of light and music.

Manchester is not only determined not to be outdone by her southern radio rival, but she has determined to beat her, and where denied the size and vastness of Olympia she has made up in display attraction.

The Big Voice.

Every effort has been made to make the 1932 Northern Radio Exhibition the big voice of the North, and it is a big voice. Even the Clerk of the Weather has been called in to assist, and by super effort he has rolled away the clouds, and the sun is shining.

How long this will last I cannot say, but the fact remains to be put on record that Manchester, beloved of Pluvius, has cast out her god (perchance only temporarily) and has taken to her bosom Old Man Sun. It is, indeed, a bright outlook for the future of Northern Radio.

MORE ABOUT THE "APEX"

(Continued from page 216.)

There will be little or no pull on the H.T. plus 1 lead; in fact, this part of the battery cord will tend to lie slack and with no strain at all, because it is the nearest point of connection. If the battery cord is subjected to pull, then the strain will be taken by those branches which join to the valveholder, earth terminal and L.T. switch.

However, if the constructor feels uneasy about this feature (although there is no reason why he should), he can spend a few more pence and obtain a holder for the resistance, and this, of course, is screwed rigidly to the baseboard.

Many will use resistances which necessitate holders, anyway.

The Grid Battery.

But there is such a short distance between the grid terminals of the third valveholder and the L.F. transformer, and the connections so simple, that it would be a pity not to employ a wire-end type of a 200,000-ohm resistance. (A "wire-end" resistance is one which has short pieces of wire instead of screws, caps and terminals at its ends.)

Keep that space on the baseboard behind the reaction condenser clear, because it is there where the short-wave coils are to be mounted.

Pro tem you could have the grid-bias battery there, but a better place is at the back of the cabinet. Some G.B. batteries have tabs through which drawing pins can be passed to hold them in such positions, but, in any case, grid-bias battery clips are cheap enough and easily obtainable.

Next week I will tell you how to operate the "Apex" to its best advantage and give you some advice concerning the selection of accessories.



We supply all good quality Receivers, Loudspeakers and Accessories on convenient Easy Terms. All orders are executed promptly. Our aim is your satisfaction.

Manufacturers' Kits

TELSEN "JUPITER" S.G.3 KIT, complete kit less valves.

Cash Price £3/17/0.

And 11 monthly payments of 7/-.

With 7/- order

TELSEN "AJAX 3," complete kit less valves.

Cash Price £3/1/6.

And 11 monthly payments of 5/8.

With 5/8 order

READY RADIO 303 KIT, cabinet model, including moving coil unit and valves.

Cash Price £6/17/6.

And 11 monthly payments of 12/9.

With 10/- order

READY RADIO 303 KIT, including valves, less loudspeaker and cabinet.

Cash Price £3/10/0.

And 11 monthly payments of 6/6.

With 6/6 order

READY RADIO "METEOR" S.G.3 KIT, including cabinet, valves, and moving coil unit.

Cash Price £8/17/6.

And 11 monthly payments of 16/8.

This Receiver also tunes to ultra short waves.

With 11/- order

READY RADIO "METEOR" S.G.3 KIT, complete kit with valves, less cabinet and speaker.

Cash Price £5/7/6.

And 11 monthly payments of 10/-.

With 8/- order

LISSEN "SKYSCRAPER 3," complete kit, including valves.

Cash Price £4/9/6.

And 11 monthly payments of 8/3.

With 8/3 order

Loudspeakers

CELESTION PPM PERM. MAG. MOVING-COIL UNIT.

Cash Price £2/7/6.

And 9 monthly payments of 5/3.

NEW R & A "CHALLENGER" PERM. MAGNET MOVING-COIL UNIT.

Cash Price £1/15/0.

And 6 monthly payments of 5/8.

NEW EPOCH 20C PERMANENT MAGNET MOVING-COIL UNIT

Cash Price £1/15/0.

And 6 monthly payments of 5/7.

With 5/3 order
With 5/- order
With 5/7 order

NEW BLUE SPOT 99 P.M. MOVING-COIL UNIT The Finest of the New Permanent Magnet Units. Price £2/19/6.

And 11 monthly payments of 5/6.

With 5/- order

BLUE SPOT 66R UNIT with large chassis.

Cash Price £2/10/0.

And 10 monthly payments of 5/-.

NEW R & A VICTOR" PERM. MAG. MOVING-COIL REPRODUCER DE LUXE with 6-ratio Transformer and Cadmium plated Grill.

Cash Price £3/10/0.

And 11 monthly payments of 6/5.

With 5/- order
With 6/5 order

Eliminators

ATLAS ELIMINATOR, A.C.244. 3 H.T. Tappings. 20 M/A out.

Cash Price £2/19/6.

And 11 monthly payments of 5/6.

HEAYBERD ELIMINATOR KIT, G.200, complete kit of parts in steel case for making a first-class eliminator. Three H.T. tappings, 50 M/A output and 4 V 5-amp. L.T. tapping for A.C. valves.

Cash Price £5/7/6.

And 11 monthly payments of 10/-.

HEAYBERD ELIMINATOR KIT, C.150, 3 H.T. tappings, 25 M/A output.

Cash Price £3/16/0.

And 11 monthly payments of 7/-.

ATLAS A.K.260, 3 H.T. tappings and trickle charger 2.4-6 volts.

Cash Price £4/10/0.

And 11 monthly payments of 8/3.

EKCO A.C. 25, 3 H.T. tappings, 25 M/A output.

Cash Price £3/17/6.

And 11 monthly payments of 7/1.

EKCO A.C.18, 3 H.T. tappings, 18 M/A output.

Cash Price £3/7/6.

And 11 monthly payments of 6/3.

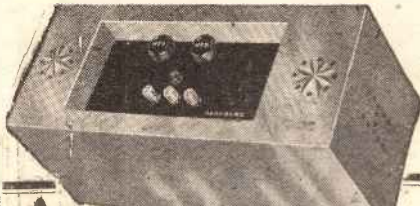
With 5/6 order
With 8/- order
With 6/6 order
With 8/3 order
With 7/1 order
With 6/3 order

To avoid delay, will customers kindly send first payment with order.

CASH AND C.O.D. ORDERS DISPATCHED BY RETURN OF POST.

All above carriage paid.

The **LONDON RADIO SUPPLY COMPANY**
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Established 1925 Phone National 1977



A D.C. MAINS UNIT

that will give you—

1. **TRIPLE ADJUSTABLE OUTPUTS:** 50, 25 or 15 ma. at 150 volts merely by plugging in to the base of unit.
 2. **TAPINGS:** 40/100v. Var. S.G., 80/120v. and 150v. fixed.
 3. **CONVERTIBILITY:** Unit is mounted on special chassis and can be converted to A.C. in one hour. Ample room in metal case for extra components necessary for conversion.
 4. **EXTRA SPECIAL SMOOTHING:** Heayberd balanced circuit, comprising two constant-inductance Chokes and 16-mfd. Block Condensers. Ensures absolute freedom from hum or noise.
 5. **SAFETY:** Units are supplied in neat bronze-finished metal safety cases. Fuses inserted in both mains leads.
 6. **GUARANTEED:** Heayberd display confidence by guaranteeing all Mains Units three years against breakdown.
 7. **LOW PRICE:** Model H D.C.150 Mains Unit for D.C. mains is supplied complete with flex and adapter for 55/-.
- Full details of complete Mains Units and Kits for D.C. or A.C. mains, are given in the new Handbook.



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handbook on
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I enclose 3d stamps for
New Handbook of Mains
Equipment. Packed with
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One minute from Moorgate Stn

TAYLEX WET H.T. BATTERIES
Give long service, improved volume
and tone, very economical.
Replacements for Taylex or Standard batteries at
low prices; details post free; also Britain List
Radio Kits and parts at lowest prices.
P. TAYLOR, 57, Studley Rd., Stockwell, London.

LOUD SPEAKERS REPAIRED. 4/-
(Blue Spot a Speciality, 5/-)
Transformers 4/-, Headphones 4/-, all repairs magnetised
free. Eliminator Repairs quoted for 24 Hours Service.
Discount for Trade. Clerkenwell 9069.
B. MASON, 44, EAST ROAD, LONDON, N.1.

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"There's no place like HOLMES."
The first firm to supply Wireless parts on easy
payments. Eight years' advertiser in "Popular
Wireless." Thousands of satisfied customers.

	Deposit	Monthly
LISSEN SKYSCRAPER	89/6	8/3 11 of 8/3
KIT	61/6	6/9 9 of 6/9
TELSEN AJAX 3 KIT	70/-	7/9 9 of 7/9
R.R. 303 KIT with Valves	£6/7/6	10/- 11 of 11/10
COSSOR KIT 334	£3	6/- 9 of 6/8
EXIDE H.T. Accum. 120v.	£2/2/6	5/6 9 of 4/6
BLUE SPOT 66R & CHASSIS	39/6	5/8 7 of 5/4
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WHAT READERS SAY

ABOUT SCOTLAND'S ONLY RELAY—SHORT WAVES IN SURREY—THE "COSMIC."

"SCOTLAND'S ONLY RELAY."

The Editor, POPULAR WIRELESS, 13th, August, 1932.
Dear Sir,—Allow me to reply to this article in your issue of August 13th.

Your special correspondent in his heading to his article states that a more northerly relay to Aberdeen, or an increase in Aberdeen's power, is unnecessary, and states in his last paragraph that "Mr. Kelsall and his worthies are out to show that these propositions are unnecessary." These statements are neither fair to the B.B.C. for whom I have no brief, nor to Mr. Kelsall, and are in fact erroneous.

The B.B.C. state that Aberdeen's wavelength is only suitable for a limited local service; your correspondent is accordingly attempting to show that Mr. Kelsall is out to accomplish the impossible. The present power of Aberdeen cannot possibly serve adequately the North of Scotland, and your correspondent should not allow his enthusiasm for Mr. Kelsall's fine efforts to distort the truth, that Aberdeen has only a service area of approximately 10 miles, two-thirds of which is wasted over the North Sea.

Listeners in the North of Scotland have no adequate services at all. They demand equal treatment with other parts of Great Britain, and the agitation for fair play will continue with unabated vigour until their reasonable demands are satisfied.

Yours faithfully,
ANDREW MURRAY
(Provost).

Town Hall, Dingwall.

SHORT WAVES IN SURREY.

The Editor, POPULAR WIRELESS.
Dear Sir,—I thought you might be interested to know what conditions on the short waves are like in Thornton Heath.

The set I use is a home-made adapter with home-made coils, followed by 2 L.F. stages. Every wire in this adapter is perfectly straight, so I imagine that it is as efficient as I can get it.

The coils are self-supporting except for a thin strip of ebonite along the top. The aerial is 30 ft. high, 60 ft. long, pointing east and west.

The most reliable DX station, I find, to be W 8 X K, 25-27 m. It is nearly always louder than R.6 and sometimes reaches R.9, with slow fading only.

W 2 X A D is never loud enough to be worth listening to, mostly about R.4-5.

There is absolutely nothing doing on 49 metres, everything being drowned by the heavy atmospherics. (Moscow, of course, comes in at R.9.)

Rio de Janeiro, 31.58 m., is a very good signal, the English news at 10.40 p.m. coming in at a good R.8. Unfortunately, it seems to be heterodyned by O X Y.

C G A comes in very well on about 22.6 m., at about 10.30 p.m. Y V Q (16-39) was heard recently quite loud. A number of stations on 14 metres have been heard but only a few identified.

The lowest wavelength I can reach is about 11.5 m. I have included a log of some of the stations I have received during the last five months.

Buenos Aires (L S Y)	14-47
Rio de Janeiro	15-57
Cairo	(approx) 16
Pontoise	19-68
Schenectady (W 2 X A D)	19-56
Pittsburg (W 8 X K)	19-72
Zeesen (D J B)	19-7
Vatican (H U J)	19-84
Tashkent	19-95
Lawrenceville (W M N)	20-77
Moscow	(approx) 21
Rocky Point (W A J)	21-67
Abu Zabal (Cairo) (S 4 Z)	21-7
Lawrenceville (W M A)	22-3
Drummondville (C G A)	(approx) 22-5
Coltano (I A C)	23-5
Coltano (I H C)	(approx) 17
Rabat	23-38
Rugby (G B S)	24-69
Pontoise	25-2
Pittsburg (W 8 X K)	25-27
Rome	25-4
Chelmsford (G S S W)	25-53
Pontoise	25-63
Rugby (G B P)	27-55
Sydney (V L K)	28-8
Nauen (D E Q)	29-0
Rugby (G B U)	30-15
Lawrenceville (W M I)	30-4
Madrid (E A Q)	30-4
Rugby (G B W)	30-64
Eindhoven (testing June 27th, 1932)	31-28
Nauen	31-09
Sydney (V K 2 M E)	31-28
Springfield (W I X A Z)	31-35
Zeesen (D T A)	31-38
Schenectady (W 2 X A F)	31-48
Skamleback (O X Y)	31-51
Rio de Janeiro	31-58

Bandoeng (P L V)	31-75
Rabat	32-26
Prangins	35-0
Nauen	(approx) 37
Kootwijk (P D M)	38-65
Radio Nations	38
Lisbon (C T I A A)	42
Lisbon (C T I A A)	31-23
Rome	43
Nauen (D G K)	44-0
Moscow (R E N)	45-38
Boundbrook (W 3 X L)	46-69
Boundbrook (W 3 X A L)	49-18
Coltano (I A C)	(approx) 47
Pittsburg (W 8 X K)	48-86
Saigon (F 31 C D)	49
Vienna (U O R 2)	49-4
Moscow	50-0
Vatican (H U J)	50-26
Rugby (G B U)	60-26
Rome	80-0
Cairo (S U V)	29-83
Maraquay (Y V Q)	16-39

SHIPS

Olympic (G L S Q)	71-82
Leviathan (W S B N)	71-82
Homeric (G D L J)	71-82
Bremen	70-80

AERODROMES AND PLANES

Ernline	Eagle Yellow 1
Buttercup	Eagle red 1
Ferret	Do. 2
Daisy	Do. 5
Fleethy red 1	Do. 3
Eagle yellow 4	Eagle blue 4

Besides the amateurs on the 20-, 40-, 80-metre band I have also included some of the 160-metre ones, although they are not really short-wave stations. Of course, being still at school and having six weeks' holiday, I find a good deal of time for S.W. searching. The total number of stations is 217, and includes all continents. All of them are telephony stations and have been heard on the loudspeaker.

I would be much obliged if you could identify the following: F P C R, O N 4 K 30; the last seems rather curious, but I am sure it was given out thus.

Yours faithfully,
R. E. D.
Thornton Heath.
[EDITOR'S NOTE.—In addition our correspondent gives a tremendous list of amateur stations received—too many to give here, and ample to show the wonderfully good range and results obtained by him.]

"COSMIC" CONGRATULATIONS.

The Editor, POPULAR WIRELESS.
Dear Sir,—May I write to congratulate you—perhaps rather late—on your "Cosmic" Three. Wonderful! is all I can say. I've never heard such a combination of selectivity, volume, and tone. The number of stations coming in is marvellous, and I have recently logged "potty" little stations of no more power than half a kilowatt at loudspeaker volume, one being in France and another in Sweden. Soon after the appearance of the articles I stopped, like an idiot, taking "P.W." for a few weeks, and now I see mention and a photo of a "Cosmic" Four! Would you be so kind as to let me know the number and date of all "P.W.'s" in which reference to the "Cosmic" Four was made, so that I may obtain all details. Thanks awfully!

A pal of mine said he had never heard a three-valver "snort" like the "Cosmic" Three before (snort meaning work well), and for him, I can tell you, it must be unusual to evoke praise!

Best of luck to your excellent paper.
Yours faithful follower,
EMMANUEL DECOTIGNIES.
Prittlewell, Southend-on-Sea, Essex.

THE ANSWERS

TO THE QUESTIONS ASKED ON PAGE 234 ARE GIVEN BELOW.

- (1) Mr. Arthur Burrows, now director of the U. I. R., and formerly "Uncle Arthur" of 2 L O.
- (2) The smaller the condenser's capacity the larger is its reactance (or "impedance").
- (3) They have now all been brought under Government control, but official statements, etc., are broadcast especially from the Berlin long-waver at Königswusterhausen (1,635 metres).

DID YOU KNOW THEM ALL?

FREE! RESISTANCE CALCULATION CHART

This is without doubt the most valuable chart yet published, as it can quickly give you the following factors:

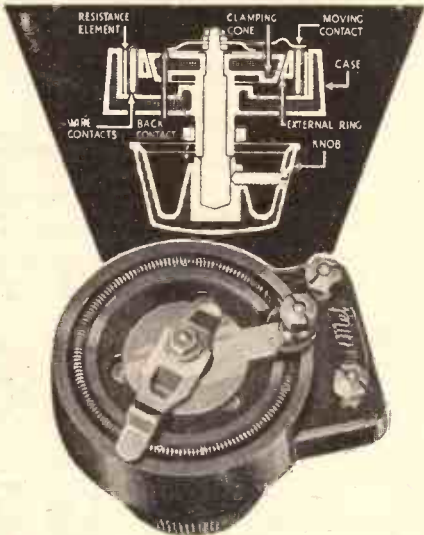
- | | |
|-------------|-----------|
| 1. Current. | 3. Volts. |
| 2. Watts. | 4. Ohms. |

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NEW WATMEL 1932-33 VARIABLE RESISTANCE —TYPE 3.

This new All-British resistance embodies many new and novel features which guarantee a higher degree of efficiency and a far steadier performance than resistances constructed on old and obsolete principles.

ADVANTAGES:—

1. The extremely firm and even contact with the element. This is obtained by a new patented clamping cone which, directly it is screwed down, forces the external ring against the wire band. The pressure is so great that perfect all-round contact is made with the element which will not vary under any circumstances.
2. Self-cleaning wiping contacts. This ensures perfectly clean contact always.
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M.C.74.

MIRROR OF THE B.B.C.

(Continued from page 224.)

finishing with the beginning of an industrial age in 1680.

On the following day comes a programme of folk songs of Worcestershire sung by the Midland Studio Chorus, and a relay from a famous glove factory in Worcestershire—the largest of its kind in England, which has been in existence and owned by the same family since 1777.

There will be a talk on glove-making by Mr. P. B. Rigden, jun., which will be illustrated by noises from the various departments of the factory. Listeners will also hear the Worcester City Schools' Festival Concert, relayed from the Public Hall, Worcester, when infants' percussion bands and massed singing by elementary schools' choirs, will be interspersed by items played by the Malvern Girls' College Orchestra.

Legends and Superstitions.

A gramophone recital of music by Worcestershire composers and artistes is down for Wednesday, October 19th, and Mrs. M. M. Priestley, editor of the "Women's Leader," will give a talk on the Folk Lore and Legends of the county of Worcester, in the course of which she will deal with many attractive legends and superstitions which still linger in the countryside.

Then comes a relay from a carpet factory at Kidderminster, with explanations by Mr. Cecil C. Brinton, and sounds of the various carpet looms.

An industrial relay from a works engaged in the making of wrought iron is in the programmes for Thursday, October 20th, and a talk on the process of manufacture by Colonel J. S. Trinham. On Friday, October 21st, another industrial relay will be taken from a factory engaged in the making of tin containers at Worcester whose output has risen from four million to forty-five million per annum in the last four years. A talk on the process of manufacture will be given by Mr. Scott R. Johnson. Later Charles Hedges is to give a recital of songs of Worcestershire.

The Super Studio.

We can expect the "House Full" boards to be required on Saturday, October 15th, when the public will be admitted for the first time to the new super-studio at Broadcasting House.

The necessary licensing formalities having now been complied with, the public will be charged 7s. 6d., 6s., 5s., 4s., 3s., and 2s., according to the class of seat required.

The concert hall can accommodate an audience of five hundred in addition to the full B.B.C. Symphony Orchestra of 115 players, but on October 15th only the Catterall Quartet with John Coates will be there on the platform. Their concert, which is the first of a series of seven Chamber music programmes to be given on Saturday evenings, until December 3rd, is certain to attract many people.

The new hall is one of the most comfortable in Europe, as is only to be expected with its last word arrangements for heating, cooling, and ventilating. The decorations are well worth a visit in themselves, and I should be greatly surprised if the tickets for the remaining concerts of the series are not quickly taken up.

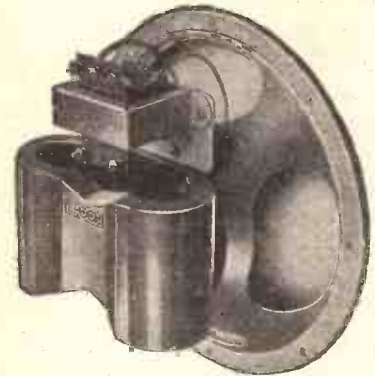
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SLEKTUN SCOUT S.G.3.—S.G. detector and power. Pilot Author Kit "A.V." (less valves and cabinet). Cash or C.O.D. **£4/8/6**. Balance in 11 monthly instalments of **8/1**. Carriage paid. With **8/1** order

COSSOR MELODY MAKER. Model 334. With metallised variable-mu S.G. and detector and valves, power valve and cabinet. Cash Price **£6/7/6**. Balance in 11 monthly payments of **11/10**. Carriage paid. With **10/-** order

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B.T.H. SENIOR PICK-UP. Complete with arm and base. Cash Price **£2/2/0**. Balance in 11 monthly payments of **3/10**. Carriage paid. With **3/10** order

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W.B. PERMANENT MAGNET MOVING-COIL SPEAKER, TYPE P.M.4. Complete with transformer. Cash Price **£2/2/0**. Balance in 7 monthly payments of **5/9**. With **5/9** order

EPOCH "20 C" PERMANENT MAGNET MOVING-COIL SPEAKER. With 5-ratio transformer. Cash Price **£1/15/0**. Balance in 5 monthly payments of **6/6**. With **6/6** order

BLUE SPOT SPEAKER UNIT AND CHASSIS, TYPE 100U. Sensitive to remarkably small inputs. For power or pentode. Cash Price **£1/12/6**. Balance in 6 monthly payments of **5/2**. With **5/2** order

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P.W. 8/10/32

THE LISTENER'S NOTEBOOK

(Continued from page 224.)

7s. 6d., and, if I may say so, it's worth every penny of it!

The Scott Centenary was duly celebrated both at home and abroad. In the main, the foreign celebrations took the form of talks—Drs. Müller and Hüppy from Schweizerischer Landessender, Mr. Arend from Warsaw, and other Polish stations, Professor Schöffler from Langenberg, while from Paris P.T.T. there was heard for the first time a dramatic adaptation by Leroy-Denis of Scott's celebrated novel "Ivanhoe."

This is what M. Leroy-Denis says in *Le Petit Radio* on the subject:

"It is only right that the date should be commemorated in France, for if the English are justly proud of their national novelist, the French also owe him a good deal.

"He was truly an innovator; it was he who created the historical novel, claiming in France many disciples and inspiring almost countless works.

The "Cinq Mars" of Vigny, certain novels of Victor Hugo, all those of Dumas père, even the Scintillating Chronicle of Prosper Mérimée, to mention only the most celebrated, proceed almost directly from him."

With our own "Centenary Programme of Verse and Drama" I was disappointed, despite its many good points, because of the tendency to let background chatter

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

By Dr. J. H. T. ROBERTS, F. Inst. P.

The Important Smoothing Condenser.

MOST experimenters find that, with rectified A.C. for the pot, it is better to use a smoothing condenser across the terminals of the field winding. The capacity of this condenser can be as large as you can conveniently make it. If you have to rely upon ordinary paper condensers you may not find it convenient to use more than 2 or 4 microfarads or possibly 8 microfarads.

An electrolytic condenser, however, is very useful in this case, especially since the current is D.C., and in that case you can go to a capacity of some hundreds or even thousands of microfarads. It is hardly necessary to add that the electrolytic condenser must be connected the right way round.

Grid-Stoppers.

There is a certain amount of difference of opinion as to the utility of a grid-stopping resistance. Some people always make a point of connecting in a suitable stopping-resistance in the grid circuit following the detector, whilst on the other hand some

IN NEXT WEEK'S "POPULAR WIRELESS"

YOU WILL FIND:—

Full details of

THE "PLUG-IN" TWO

AND

A long article on

THE "APEX" IN ACTION

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interfere with and spoil the main dialogue. This tendency is too frequently present in such productions, but on this occasion, I thought, it was more pronounced and distracting than ever.

I hope producers will take the hint and cut down very considerably the amount of noise which they allow and which too often distracts attention from the main theme.

An analysis of the world's radio fare reveals the interesting fact that Great Britain broadcasts most music. Germany shares with Norway the record for talks, France and Switzerland tie for first place in criticisms, while Sweden and Norway top the list for religious broadcasts.

Thanks to "Radio Paris" France holds, in addition, a special record for physical culture.

people consider that the stopping resistance upsets the characteristics of the valve, causing it to overload more easily, and for that reason they prefer to dispense with the grid-stopper.

The grid-stopping resistance may conveniently take the form of 100,000-ohm grid-leak in the grid circuit following the detector; it may be joined between the grid terminal of the transformer and the grid terminal of the valve-holder. The purpose of this resistance is to cut down any high-frequency voltages which might get through and so upset the normal operation. In point of fact a high resistance in this position does have this effect, but if the value is too high, and particularly if the valve has a rather high capacity, the disadvantage is that the upper audio frequencies are apt to be weakened.

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

This depends largely on the actual value of the stopping-resistance used. With a pentode valve, for instance, you will generally find that if a resistance of the above-mentioned value, say 100,000 ohms, is used, there will be a marked effect upon the upper notes.

Overloading the Valve.

At the same time the valve will tend to overload more easily and the slightest overloading will upset the quality.

A good deal depends on circumstances, and if you particularly want to introduce a grid-stopper you should try out different values until you get one which cuts down the H.F. current sufficiently without interfering unduly with the overload characteristics of the valve or with the quality of reproduction.

Screen Voltages.

When using a screen-grid valve you should take care to use a sufficient voltage on the screen. Many people fall into the error of using insufficient voltage on the screen of an S.G. valve. The question of grid bias enters into the question as well, and there are lots of screen-grid valves which only take a bias of 1.5 volts negative when the specified screen-grid voltage is used; if you use an insufficient grid voltage in these circumstances you cannot expect to get good results.

If you connect a potentiometer to the screen of the S.G. valve for the purpose of controlling volume you will readily notice the effect upon the quality of reproduction when a strong signal is tuned in and the volume of this is adjusted by means of the potentiometer.

Potentiometer Control.

By shifting the potentiometer to the minimum position it is very likely, if the screen-grid voltage is wrong, that you will notice distortion in the reproduction, and for this reason the potentiometer form of volume control with an S.G. valve is often condemned.

As a rule you will find conditions somewhat easier, from the point of view of distortion, if there is no grid bias used on the screen-grid valve, the circuit being completed by connection to the negative low-tension.

Aerial Developments.

The aerial, especially of the "outside" variety, has always been one of the "problems" in broadcast reception. There are still plenty of enthusiastic experimenters who prefer a good outdoor aerial, but on the other hand, there must be a large proportion of people who, either for convenience or from force of circumstances, use an indoor aerial or a frame. With a portable set in the ordinary sense, a self-contained frame aerial is, of course, essential.

Attempts have been made for many years, and with more or less success, to use the electric-light mains as the aerial. This scheme, however, can only be said to have met with moderate success until fairly recently. But since the introduction of the modern A.C. valve with its enormous amplification the use of the mains as an

(Continued on next page.)



In the days when the Vibrolde cost 1/6 it sold in larger quantities than any other valveholder designed for home constructors. Today you can buy this identical holder for 10d.!

Consider the specification. Spring-grip sockets hold the valve suspended immune from shock, lengthening the emission life of the filament and damping out "pong." Indexed knurled terminals, or, if you prefer to solder, tags in one piece with the sockets.

Valve pins cannot touch baseboard or chassis because of insulating disc in base which also forms dust-proof cap.

Limiting piece to prevent strain on spring contacts which are themselves recessed to guard against wrong insertion of valve.

An honest job, my masters and the price is ten pence.

May we send you our List 1292 describing the Benjamin Transfeeder (resistance coupled transformer unit) and giving circuits showing it in use?

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Compare it with much higher priced Transformers and you will see why it always pays to use Tunewell. Wound on 4-section bobbin. Insulation tested at 1,000 volts A.C. Good response 50/15,000 cycles. Excellent bass without high-note loss. Ratio 3½ to 1

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ADDRESS

★ Cross out which not required. P7

TECHNICAL NOTES

(Continued from previous page.)

aerial has at last become a really practical proposition.

A Useful Book.

I have received from H.M. Stationery Office a copy of the new "Admiralty Handbook of Wireless Telegraphy, 1931."

It is stated in the preface that "The Lords Commissioners of the Admiralty have decided that a standard work on Wireless Telegraphy is required for the information and guidance of officers and men of H.M. Fleet; for this purpose the 'Admiralty Handbook of Wireless Telegraphy, 1931' has been prepared at H.M. Signal School. This book supersedes the 'Admiralty Handbook of Wireless Telegraphy, 1925.'"

All those of you who are seriously interested in the technicalities of wireless will find this book a veritable mine of information. It contains over 1,000 large pages and many hundreds of diagrams and illustrations. The text is prepared by real experts on the subject, and therefore can be relied upon as being accurate and authoritative.

Radio Theory and Practice.

It is impossible in the very short space at my disposal to give anything like a sketch of the contents, but perhaps I may mention that after dealing with wave motion and the general principles of electricity and magnetism (including, of course, inductance and capacity), the book goes on to consider alternating currents and alternating current machines, transformers, oscillatory circuits, reception and detection of electro-magnetic waves, thermionic valves, transmitting circuits, receiving circuits, the valve as a generator of oscillations, radio telephony, high-frequency reception and transmission, aerials and earths and wave-meters.

It does not, however, specifically deal with broadcast receivers as such, but at the same time all the principles involved in receiving circuits are fully dealt with.

This book is obtainable at 7s. 6d. net from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. or, of course, through any bookseller, and I advise you all to get it.

A Wonderful Microphone.

New types of microphone are continually being invented, every one being claimed to give still more faithful reproduction than the rest.

The latest development I see comes from the laboratories of the R.C.A. Victor Company, U.S.A., and the new microphone, which is called a velocity or ribbon microphone, employs a very sensitive ribbon of duralumin instead of the ordinary diaphragm. It is claimed that this ribbon will respond uniformly to a range of sounds from a few vibrations per second up to 14,000 cycles, which means, according to the inventor, that "all the subtle overtones and shadings which give vitality and life to the sound are faithfully reproduced to give the illusion of reality."

It is also claimed to be free from the defect of previous microphones which tend to over-emphasise certain notes when these happen to be resonant with the vibrating diaphragm. High-pitched sibilant sounds

(Continued on next page.)



An important announcement to

ALL RADIO CONSTRUCTORS

The prices of the famous W.B. VALVEHOLDERS and SWITCHES

HAVE NOT BEEN RAISED

These components, so characteristic of the best traditions in British manufacture, are so unique in quality, precision and reliability that, to-day, they are used in practically every leading experimental laboratory in Britain. Made by the makers of the W.B. Moving-Coil Speakers.

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TECHNICAL NOTES

(Continued from previous page.)

suffer from a defect which sound experts sometimes describe as "whiskers."

Praise.

According to the account which I have before me of this microphone it would seem to be a very wonderful thing, for I learn that "the rattling of a bunch of keys actually sounds like rattling keys and not like a string of tin cans drawn along a rocky road."

After a description like that it would be useless for me to make any further comment. This microphone, at any rate, doesn't speak for itself—it doesn't need to!

Band-Pass Circuits.

I have a letter from a reader who says that he is using a band-pass aerial circuit but is unable to get rid of the double-hump effect. This effect, as you know, often occurs with band-pass circuits, and I think it might be useful to deal with this question fairly broadly, for the sake of any other readers who may be similarly troubled.

In the particular case under review it seems to me that the double-humping effect is due to improper matching up of the tuning of the band-pass coil. A ganged condenser is used, and it is probable that in this case the trimmer capacity is insufficient to match up properly.

As you probably know, the capacity of the trimmer differs in different makes of ganged condenser. If this capacity is insufficient it may, as I say, prevent you from getting proper matching up, and this in itself may be the cause of the double-hump effect not being got rid of.

Non-Inductive Condensers.

Another point to watch in a band-pass circuit is the question of fixed condensers. If a fixed condenser is of the so-called "inductive" type it may upset the tuning, and you will have to remove the condenser and substitute one which is definitely of the "non-inductive" type. Perhaps I should add that when using band-pass circuits it is, in any case, always a very sound plan to make certain that the condensers used are of the non-inductive type.

Watch Pentode Coupling.

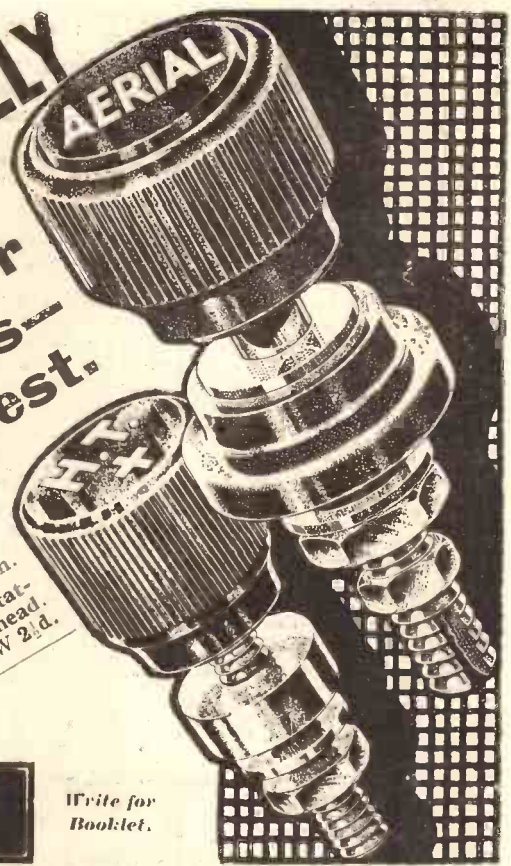
Often when a pentode output valve is used this is coupled to the detector valve by means of a transformer with a fairly high ratio, sometimes say 5 to 1 or even 7 to 1. The object is, of course, to get the maximum amplification.

But when using a rather high-ratio transformer like this it is quite likely that the quality of the reproduction will suffer, and I think you will find that, at any rate in a great many instances, it is better to use a transformer with a somewhat smaller ratio.

This in itself will often improve the

(Continued on next page.)

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PLEASE be sure to mention "Popular Wireless" when communicating with Advertisers. Thanks!

TECHNICAL NOTES

(Continued from previous page.)

quality very considerably, although you may not perhaps get quite the same magnification; but it is worth while making a very small sacrifice in regard to actual loudness for the sake of a considerable improvement in quality.

A Useful Dodge.

Another little dodge which may be tried is to connect a high resistance, say 100,000 ohms up to $\frac{1}{2}$ a megohm, across the secondary winding of the transformer. A convenient form of this high resistance is a grid leak of any value between 0.1 and 0.5 megohm. This, again, may reduce the loudness very slightly, but sometimes has a remarkably improving effect upon the quality.

Variable-Mu Valves.

With an ordinary valve, if the grid bias is unduly increased the valve goes, as it were, beyond the bend and distortion results. In the so-called variable-mu valves, however, this defect is got over by straightening out the characteristic curve of the valve and so preventing cross-modulation.

NEXT WEEK

There will be a special article on

SOME NEW TRUE-VIEW EXPERIMENTS

POPULAR WIRELESS
Out on Thursday. Threepence.
DON'T MISS IT!

A properly designed variable-mu valve will stand up even to a considerable amount of bias applied to the grid for the purpose of volume control. The variable-mu characteristic is obtained by altering the pitch of the spiral of the grid, this being gradually increased from one end to the other instead of being uniform throughout the whole length.

Electrolytic High-Capacity Condensers.

Electrolytic condensers have been struggling for recognition for several years but, having been greatly improved, are now coming into popularity at last. Several readers have asked me from time to time why it is that an electrolytic condenser, unlike an ordinary fixed condenser, has the terminals marked respectively "positive" and "negative," and also why an electrolytic condenser must be used with D.C. voltage.

If you consider for a moment the principle of the electrolytic condenser you will see why this is. Those of you who have used the old-fashioned liquid rectifiers—I mean the very old-fashioned ones, of the ammonium phosphate and borax types—will

recollect that the theory of working is that a non-conducting film forms upon the aluminium electrode when the current tries to pass one way, this film, of course, preventing the current from passing.

At the moment that the state of affairs in the rectifier is as mentioned above, we have the whole of the voltage applied to the rectifier acting across the faces of this film, and as the film is excessively thin it means that the capacity there is very large.

How They Work.

Well, this is the principle used in the electrolytic condenser and you will readily see why such an enormously large capacity can be obtained in such a small space, and also why the condenser has to be used only one way round; if the condenser is used the other way round the insulating and capacity film will be broken down and the condenser will allow current to pass through.

If alternating voltages are applied to the electrolytic condenser it will act as a rectifier, but at the same time chemical actions will take place inside it which will quickly damage it for further use as a high-capacity condenser.

Direct Radio's "Apex" Kit.

Will readers please note that the easy payment price of the "Apex" Kit Model 4 (£9 10s. 6d. complete) is twelve equal monthly payments of 17s. 6d.

In the Direct Radio advertisement on page 154 last week, the figure was given as 17s. 0d., but this was a printer's error

IMPROVED EARTHING

Messrs Graham Farish have notified us that a great deal of interest in improved earthing devices evidently exists all over the country. They have received several hundreds of letters from both the public and the Trade congratulating them on the introduction of the Filb Earthing Device, which embodies a chemical that spreads through the earth and attracts moisture, thus decreasing the earth resistance.

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G.E.C. Radio SUPREMACY IN RADIO

The VIKING- 4 TUNED CIRCUITS

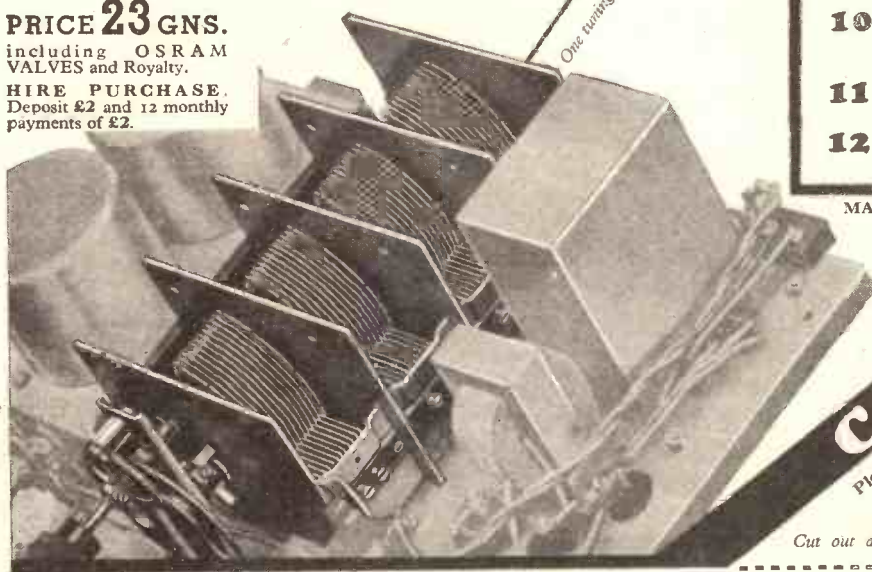
— with band-pass input filter

Here you have the secret of this set's supremacy. Such advance designing, incorporating five OSRAM A.C. Mains Valves (including rectifier) and the latest developments in radio-technique, secures the highest standard of reproduction. The VIKING gives you power and distance with purity and selectivity. An amazing number of British and Continental stations can be received at full strength by means of one-knob tuning only, while the new illuminated automatic station index makes the selection of stations and the operation of the set extremely easy. The built-in loud speaker is of the latest mains energised moving coil type.

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- 1 Four tuned circuits with band-pass input filter.
- 2 Two H.F. screen-grid stages with variable-mu valve.
- 3 Screen-grid detector.
- 4 Power pentode giving undistorted output of 2½ watts A.C.
- 5 Energised Moving Coil loud speaker; provision for external loud speaker.
- 6 Single tuning control, 200-550 and 900-2,000 m.
- 7 Automatic station index.
- 8 Variable-mu volume control without reaction.
- 9 Mains aerial device and facilities for gramophone pick-up.
- 10 Universal mains transformer with 100-150 and 200-250 voltage range, 40-80 cycles.
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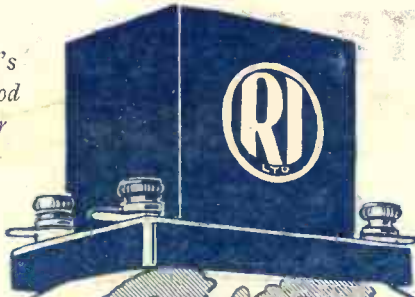
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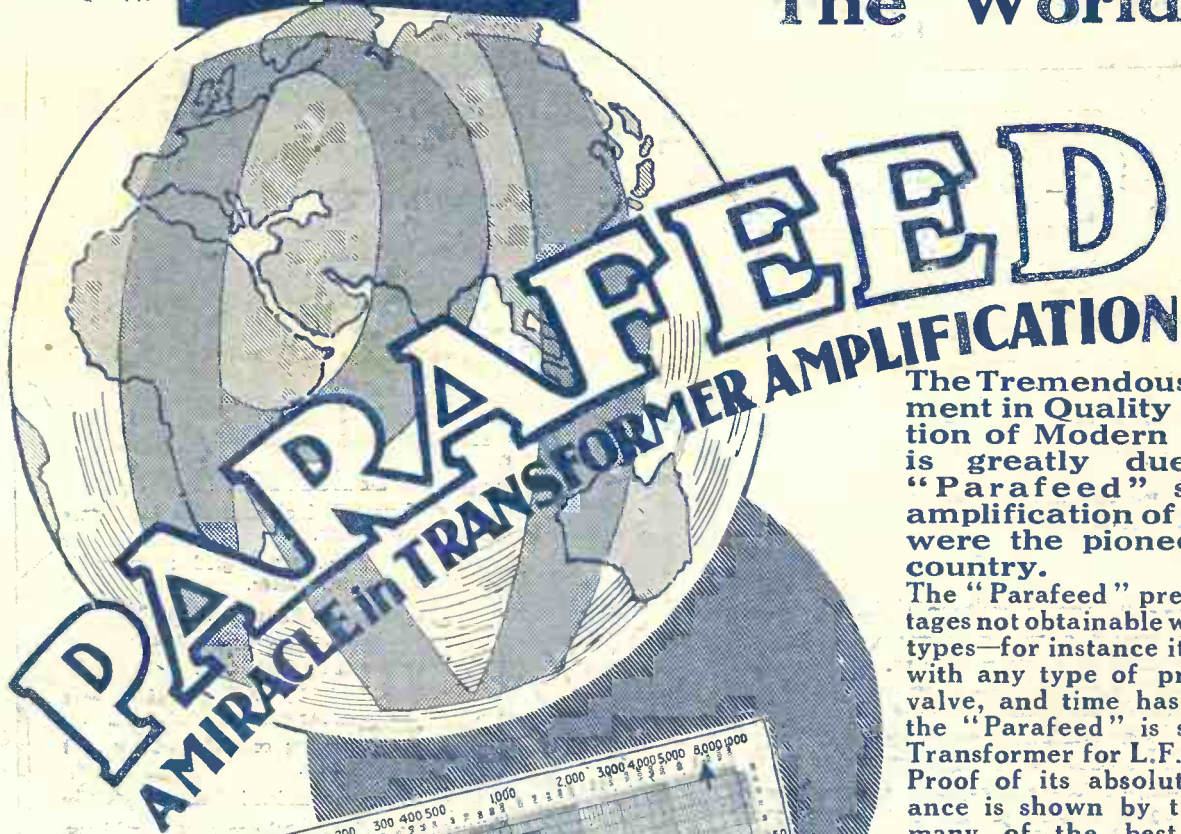
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The "PARAFEED" System Leads Receiver Design throughout The World.



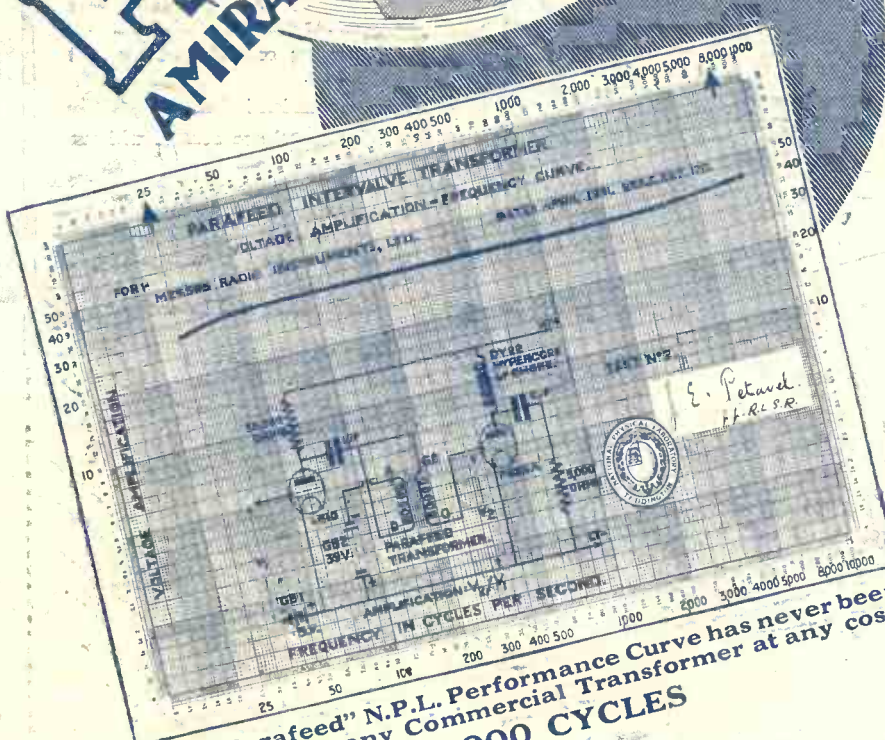
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The advertisement of R.I., Ltd., Purley Way, Croydon, Surrey. Phone: Thornton Heath 3211.



*Capt.
P. P. Eckersley's*

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Atlas A.C. 300, H.T., L.T., G. Bias, £ 6/10/0. 12 monthly payments of 12/-.
Atlas D.C. 15/25 H.T. only, £1/19/6.

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Jupiter Three Valve Cabinet Kit, £6/0/0. 20/- down and 11 monthly payments of 10/6. With Special Cabinet. Free Blueprints.

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BOWYER LOWE special pick-up volume control, 8/6.

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GOLLARO AUTOMATIC A.C. Induction motor, £2/10/0.

RADIOGRAM Switch, 2/9.

GOLLARO COMBINED A.C. induction motor, Pick-up and volume control in one unit, £4/0/0. 12 monthly payments of 7/6 or with "159" Table Grand Walnut Radiogram Cabinet £6 10 0 or 12 monthly payments of 12/-.

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Direct Radio

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Please dispatch to me at once the following goods

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ADDRESS

POPULAR WIRELESS HANDBOOK.

CAPT. P. P. ECKERSLEY'S QUERY HANDBOOK

Captain Eckersley needs no introduction to readers. He is undoubtedly one of the world's foremost radio engineers, and was for several years Chief Engineer of the B.B.C., in which capacity he carried out pioneer work in helping to place broadcasting upon the sound basis on which it rests to-day.

Captain Eckersley's knowledge of radio is unique, and his writings upon the subject are, therefore, authoritative. In this handbook he solves, in his inimitable manner, problems touching on practically every branch of radio reception, the questions and their replies being sectionalised for easy reference.

It is a book that every enthusiast should possess.

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ALL ABOUT AERIALS

Aerial efficiency is what everyone desires, because upon this the effectiveness of the set depends. You can improve your results by reading what Capt. Eckersley says.

WOULD IT HELP?

A. A. R. (Cheam).—"When I recently shortened my aerial in order to get greater selectivity, I noticed a marked loss of signal strength. Could I still retain this improved selectivity and at the same time bring back my lost volume by increasing the number of wires in the horizontal span?"

No! Very unlikely!

Aerials can be "calculated" pretty exactly when one is dealing with supporting masts of insulating material and/or far enough away from the downlead, when there are no buildings or metal structures nearby, when the earth is made by a fan of copper spreading far beyond the confines of the area "shadowed" by the aerial, and so on.

But when it comes to a bit of wire strung up in a garden, with cisterns and lead pipes, telephone wires, and tramway conductors all round, and an earth half on to a gas-pipe and half to a water-pipe (which is touching a gutter), aerial calculation becomes a little difficult. Nevertheless, I answer your question firmly by saying, No! Very unlikely!

RAISING THE AERIAL.

C. N. (Dartford).—"I have an opportunity of increasing the height of my aerial from 20 to 30 feet. I have been wondering whether this will give me better signal strength and range.

"If the increased height will improve my range, then the alteration will be worth while, otherwise I shall leave my aerial as it is at present. Can you advise me, please?"

Theoretically the increased height of the aerial should bring about increased signal—But!

If there is considerable capacity between aerial lead-in and earth, i.e. if the lead-in cannot be run very free from any metallic objects.

If the earth is poor anyhow.

If the coils are of high resistance or if there is heavy damping in the aerial—it is unlikely you will benefit much.

WHICH END SHOULD BE HIGHER?

M. B. (Bournemouth).—"When the 'roof' of an aerial cannot be made very high, it is sometimes recommended that the end farthest from the lead-in be higher than the near end. It is never stated that the aerial should be arranged with the near end higher than the far end. Is there any reason for this?"

No; not that I can see. An aerial is the more efficient as its effective height is greater.

The effective height of an aerial is determined by its physical shape. In general, you want a large vertical part attached to a "roof" as you call it, which roof should have large capacity to earth.

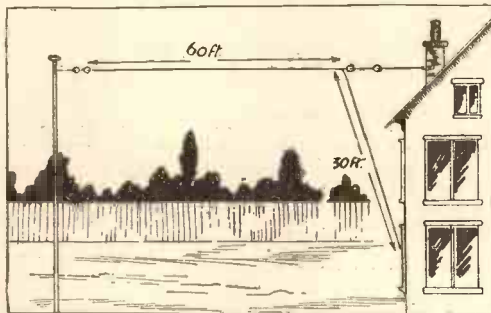
It is, of course, essential to get both these qualities at once, a large capacity to earth alone is nothing, vertical height is not anything like effective height until the roof capacity is large.

SPACING INDOOR LEADS FROM WALLS.

J. D. R. (Norwood).—"Is it essential that a lead-in wire from an indoor aerial should be kept well away from earthed objects such as walls?"

It would in most cases be better from an electrical or wireless point of view to keep the indoor aerial away from the walls of the house.

A GOOD ARRANGEMENT TO USE



A horizontal span of 60-70 feet, and a down lead of 30 feet, is an arrangement capable of giving excellent reception on the broadcast wavebands.

All About Aerials—Continued

FOR THE FLAT-DWELLER.

M. A. (Ilford).—"I have been told that the regulations require the metal casing of house-lighting wiring to have no greater resistance than two ohms.

"If this is the case, it seems that connecting the earth terminal of a wireless set to this metal casing would provide an excellent earth for flat-dwellers and others to whom the provision of an earth is a problem.

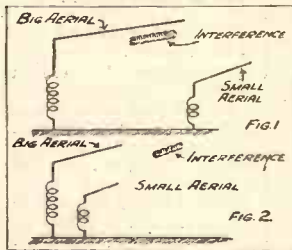
"Would so doing be safe? Or is it similar to earthing to a gas-pipe, which I have been told is unsafe?"

If you earth to the electric conduit of house-wiring, it is true that you are connecting the earth through a low resistance. But suppose you are in a flat, 30 ft. above the earth level, then you will see that you are really connecting your earth to a very effective aerial because the waves get picked up by the casing; and the casing is, from the point of view of high-frequency currents, alive.

If you are on the ground floor, you are tied on to a considerable aerial system; but, of course, the path to earth is shorter and you will not, in all probability, get deleterious effects.

As a matter of fact, frequently when I am confronted with this problem I do not use any earth at all, and use the conduit of the electric-light wiring as an aerial. So it comes to this, that if you are on the ground floor, use an aerial on to the aerial terminal

NOISE FROM MACHINERY



A great deal depends upon the aerial's distance from the source of interference.

signals than if you take off the earth, but the best signals if you put the aerial on to the conduit (at least, this has been my experience in two or three cases).

SINGLE-WIRE AERIALS.

A. N. C. (Rochester).—"Will you tell me why it is that the average broadcasting aerial is usually of the single-wire type?"

"I notice that on ships more than one wire is used. In fact, on a naval vessel I saw an aerial comprising two parallel 'sausages' each containing six wires."

You've got to take a lot more care with a transmitting aerial than with a receiving aerial. Every wasteful ohm in a transmitting aerial may lose you kilowatts.

You can destroy lots of ohms in a receiving aerial by using reaction. Thus, supposing you had a transmitting aerial with a 50 per cent. radiatic efficiency and you had 100-kilowatt input, 50 would be useful, 50 wasteful.

Increase the radiatic efficiency to 75 per cent, and 75 are useful, 25 wasteful. Any receiver will get a much stronger field strength because of the increased efficiency, and this is a gain in level of wanted over unwanted signals.

But in a receiving aerial, doing the same thing would merely make the receiver get a little stronger signal, whereas the signal could be increased tenfold by putting on another valve in the amplifier.

The efficiency of the transmitting aerial is thus all-important, and the receiving aerial doesn't matter if you can have a valve set. But with a crystal receiver it's well worth while looking to the aerial.

BETTER FOR DODGING ELECTRICAL INTERFERENCE.

B. J. U. (Lancaster Gate).—"I use a fairly sensitive receiver for the reception of the main continental and several of the English stations, and although the selectivity of the receiver is quite good, I am greatly troubled by interference from machinery situated locally.

"Which would be the preferable arrangement of the aerial, a large outside aerial with means for obtaining adequate selectivity in the receiver, or a small indoor aerial with fairly tight coupling to the receiver? Which arrangement should give the greatest freedom from the interference experienced?"

It is very difficult to say. Sometimes the interference-producing machinery radiations are very local and die away quickly, in which case a small indoor aerial would be better. This is true in degrees always.

But much depends upon how close you are to the interference. If very close you can weaken it by moving relatively quickly away from it, i.e. by increasing the distance of your aerial from the interference by a large ratio.

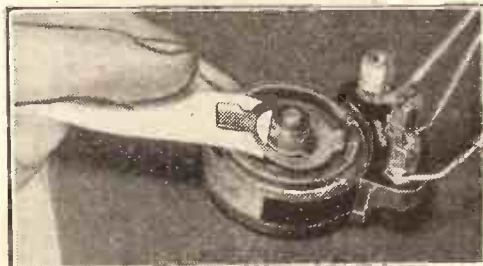
If you are already aerial dimensions away you won't make much difference in drawing in your horns, as it were. In Fig. 1 you have altered the relative distance from the aerial very much by using the small one. In Fig. 2 there is hardly any difference in relative distance of the two aerials, but the small one may be a tiny bit better.

EVER TRIED IT?



If you are "hard up" for wad-plugs, don't forget that match-sticks make an effective temporary substitute.

KEEP THE CONTACT CLEAN



A faulty connection between the slider of the volume control and the resistance element can cause bad cracklings in the loudspeaker. A simple method of cleaning the contact surfaces is shown in the above photograph.

All About Aerials—continued

AERIAL OUT OF THE WINDOW ?

A. McG. (Glasgow).—"I have been told that the horizontal span of an aerial does not contribute appreciably to the pick-up efficiency of the aerial. Is this so ?

"If so, can I operate my receiver on the top floor of a three-storey building by using for an aerial a length of wire hanging out of the window, and nearly reaching to the ground ?"

In an ordinary receiving aerial, the top horizontal part frequently does no more than add capacity effects and resistance to the aerial, and is no good. If you have an open site, however, the horizontal part is useful.

You see, when waves come along they set currents oscillating up and down in the aerial ; if you have got a vertical wire the currents have got to stop at the top, and, therefore, the total freedom of movement, as it were, is limited. The horizontal part of the aerial, if it is connected, does not pick up any more radiations, but it allows space in which currents may pour, and so gives greater freedom of movement in the vertical part. I think that is a fair way of expressing it.

I think by far your best way is to operate your receiver on the top of your three-storey building either by hanging a wire out of the window, or, as I suggested to another correspondent, using no earth and connecting the aerial terminal to the earth conduit of the electric-light mains, if you have them.

A water pipe would do, NOT AS THE EARTH TERMINAL, BUT AS THE AERIAL TERMINAL. Do not use an earth.

You will see how this works if you turn everything upside down and say that the earth is the horizontal part of the aerial, the vertical part of the aerial being the water pipe or conduit, and the earth terminal being the air !

To avoid hanging things out of the window, try the water pipe, but if this fails, do as you suggest.

It's impossible to lay down hard-and-fast rules with so many variables to consider.

INDOOR DIRECTIONAL EFFECTS.

M. H. (Kensington).—"Whilst using my portable receiver in a flat which is part of a steel-framed building, I noticed that in various rooms the frame aerial requires to be swung in a different direction to receive a given station. That is, in one room it is pointing towards north and in another it has to be turned to east to receive the same station. What is the cause ?"

The reason signals are variable both in strength

and apparent direction is because the steel-frame building distorts the fields just as flowing water has its lines of force distorted by the piles of a bridge and by any rigid objects in the water

THE "TREE TRAP."

J. H. H. (Clapham).—"I have been told that in certain circumstances a tree can be used as an aerial, provided satisfactory electrical connection can be made through the bark to the 'sap-carrying' part of the tree.

"Since the roots are buried in the ground, it seems curious to me that it is possible to use it as an aerial. Will you please enlighten me on this point ?"

The tree is a very high resistance aerial. Physically we have conditions as at (a), which is electrically as in (b).

If there is a source of e.m.f. caused by the arriving waves at P there are two paths to earth ; through the tuned circuits or through the resistance R.

If the resistance R is large the set is NOT short-circuited and some current goes through the set. But the ordinary aerial connected in the ordinary way is much better !

THE SHOCK AFTER THE STORM.

"Perplexed" (South Shields).—"Recently, fearing that my aerial might get struck by lightning, I disconnected this during a storm. Later on, after the storm had ceased, I attempted to connect this to the set, and received a violent shock. Why did I get this shock ?"

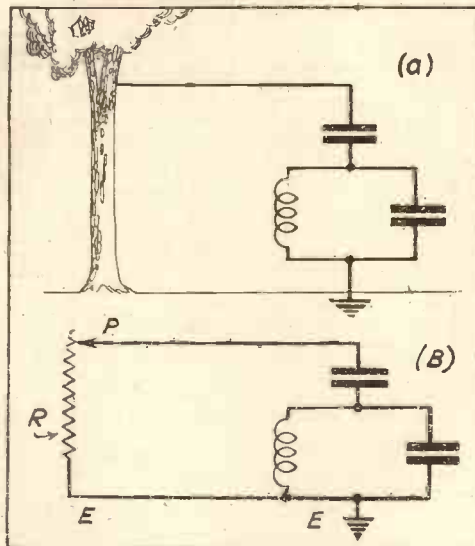
You got this shock because the aerial got charged up as an insulated conductor. The celebrated Franklin (the first one, not "C.M.," who designed the beam station transmitters) flew a kite on a conducting wire, and he insulated the wire from earth and drew considerable sparks from his kite-carried conductor.

As you go up and up into the air the electric potential to earth increases with increasing height. In a thunderstorm this potential increases more rapidly than when the electric state of the atmosphere is more stable.

So if you put a wire into the air it collects a charge, and this charge, since the wire is a conductor, spreads itself evenly over the wire. But when you, an earthed body, touch the wire, the charge passes through you to earth and you give a jump !

Moral.—If, as you should, you disconnect your aerial during a thunderstorm, earth it as well. Use a switch which in the "off" position earths the aerial ; in the "on" position connects the aerial to the set.

TREE AERIALS ARE NOT IDEAL



"J. H. H." asks whether a tree can be employed as an aerial, and the bottom diagram shows that in such circumstances the tree is simply equivalent to a high resistance in parallel with the aerial circuit.



Is Your Earth Good?

A set coupled to a poor earth can never give its best results, and very often such an earth will cause oscillation and howling.

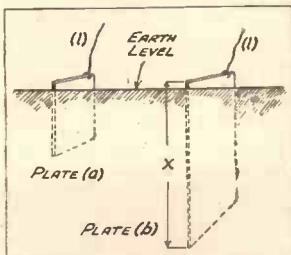
INSULATED OR BARE?

A. J. B. (New Eltham).—"Does it matter whether the earth lead is insulated or not? Some people say that you should use insulated wire, while others say that bare wire is quite O.K. Which is best?"

This depends if you are designing a really efficient aerial system or not.

Actually the earth wire should be taken down to the earth well away from any material object; or, with a less degree of finesse, it should be insulated. But it is useless taking all these precautions if the rest of the system is not studied in like proportion.

BURY IT WELL!



A good-sized earth plate well buried makes an efficient earth, but a small plate only partially buried is definitely bad.

In transmission it's quite another story.

HOW DEEP?

H. Q. (Colchester).—"I have been told to bury my earth plate as deeply as possible, and also to keep the earth lead as short as possible. I can't very well have a short lead to my earth plate if it is buried very deeply. Does this matter?"

In the vertical sections of earth I have shown the length (1) of the lead is in each case short, but plate (a) is small and shallowly buried; plate (b) is larger and more deeply buried. Plate (b) is better than (a). About 1 ft. 6 in. is enough, however, for dimension (x).

Leave the edge of the plate just sticking above ground and make a good soldered joint to the wire. Do not bury this joint. The plate could be 16 gauge.

DUPLICATING EARTHS.

P. B. (Catford).—"I have been told that using two earths is undesirable.

"For some time past my earth system has consisted of a lead taken to the main pipe, and also another lead from the earth terminal to a plate buried in the ground. I was under the impression that this would ensure a good earth at all times.

"Now I am rather doubtful and would like to know whether I would get better results if I did away with one of the earths and only used, say, the water-pipe?"

Why not try it and see?

In general, one can say that there is no gain in putting one very good earth (water pipe) in parallel with another very good earth (buried plate), and there might conceivably be a slight disadvantage in doing so if one was slightly worse than the other.

The bad thing to do is to put a bad earth in parallel with a good one; that may result in just a bad earth. One good earth is simplest, two good earths in parallel is possibly not so good. But I'll bet you would not notice much difference if you disconnected one of your earths, provided they're both good. Why not try it and see?

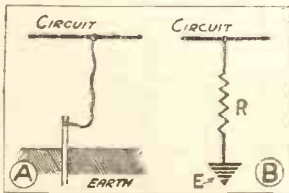
TUBE OR PLATE?

H. K. (Ilford).—"I am installing a new earth, and I wonder if you will be kind enough to say whether an ordinary earthing tube is likely to be as efficient as a metal plate buried deeply in the ground. The earth tube appeals to me, because it is so simple to fit."

I suppose that theoretically the earthing tube may introduce an ohm or two more in the aerial circuit than if a plate were used.

But the total change in efficiency, using the plate rather than the earth is probably of the order of one or two per cent only. Considering that retroaction can change the aerial efficiency from say 10 to 90 per cent, why worry?

A HIGH RESISTANCE



The effect of a poor earth connection is equivalent to inserting a resistance in series with the earth, as in (B).

Is Your Earth Good?—continued

CURING A HOWL.

H. K. (Cardiff).—"I find that my receiver, which is of the simple Det. and 2 L.F. type, tends to howl when I remove the earth, although it is perfectly stable when the earth connection is made.

"Can you tell me why the removal of the earth connection can make the L.F. side unstable?"

Well, you know, that's rather a tall order! We do like our earth in our receiver, as Punch would say! But look!

In any valve circuit we want each valve to take in something on its grid and spit it out more strongly via its anode. We don't want it finding what it's pushed out coming back again on its grid in different phase and a'l mucked up, because then everything gets confused.

And if every valve starts being promiscuous and coupling back, to perfect strangers all sorts of strange new effects are born and make for "that sort of trouble."

Valve society becomes disordered unless we keep every unit in order, doing what it's told to do.

And one way of keeping everything orderly is to bring a part of each valve circuit to earth. Remove this, and the valves are free, casual, anyhow, and go coupling all over the place.

A PLUMBING MYSTERY.

S. B. (Harrow).—"I have recently been troubled with interference of the crackling type and, while endeavouring to remedy this trouble by alterations of the aerial and earth system, I found that using a very short earth lead of about two feet (this being taken to damp earth) completely cured the trouble.

"Previously the earth was connected by about a 6-ft. lead to a main water pipe, and I am at a loss to see why a comparatively small alteration such as this should have such a considerable effect."

I am also at a loss to give you an absolutely categorical answer. Perhaps the water pipe had a bad earth contact somewhere; perhaps it was badly bonded to other water or gas pipes; perhaps the pipes ran near to some source of interference.

I know of cases where the water-pipe earths are very bad, but are always improved when someone goes into a dark and filthy basement and, lighted by a blow-lamp, solemnly solders a century's plumbing into one electrical mass!

I do not suggest you live above such a basement, but there may be something "loose" somewhere.

LENGTH OF THE LEAD.

N. R. S. (Mitcham).—"I have just moved into a new house, and I am fitting up my four-valver.

"I find that I have to take my earth wire about 15 ft. to reach the main water supply pipe. On the other hand, I could arrange to have a buried earth about 3 ft. below the window, the length of the earth lead in this case being about 5 ft.

"Would this be better than the water-pipe, or doesn't the extra length of wire matter?"

It's most awfully difficult to say. On principle, one does not like a long earth lead because it means that the filaments, screens, etc., are not quite at earth potential, and so you may introduce instabilities. On the other hand, such effects may not occur. You only risk them.

I must say I always feel happier seeing a short, fat little wire racing straight into good honest wet earth. But then, I was brought up on transmission!

ANCHORING A CIRCUIT.

R. D. (Lee).—"I have often wondered how an earth is obtained on a ship. Since the vessel is surrounded by water, it seems impossible for a normal earth to be used. Is this so?"

"An earth" only means that an electrical contact is made between some one (or more) conductor and "the earth," meaning the world, if you like. We want to anchor a certain point of a circuit so that its potential will not vary.

You cannot change the total potential of the whole world relative to an ordinary circuit, so the earth is our anchor of zero potential.

Now, water, and particularly salt water, is a good conductor, and when you tie a circuit to the metal hull of a ship, and when that whole metal hull is touching water, and when water as big as an ocean is touching sea bottom—well, you've got a very good earth!

PAINT THE JOINT.

C. J. (Birmingham).—"I am constantly having trouble with the soldered joint on my earth plate. The plate, which is of zinc, is buried three feet below the surface of the ground, and the connection between the earth wire and the plate corrodes very quickly. How can I stop this?"

When copper and zinc are joined and are also kept moist by burying them in the earth, electrolytic action takes place which corrodes the joint. One way is to leave a tongue of zinc to come above the ground and then even use iron wire, zinc covered to join a sheltered earth terminal.

This is rather unnecessary, and I think if you make the joint in air above ground your troubles will cease. Anyway, paint the joint above ground.

IN THE CELLAR.

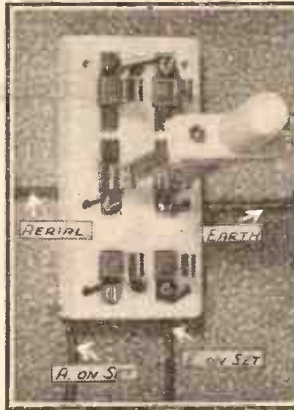
M. L. (Hastings).—"My receiver is at present earthed to the main water-pipe in an underground cellar. The arrangement allows of a short connection to the water-pipe.

"I am, however, wondering if I could obtain a better earth by digging a hole in the cellar and burying a copper-plate?"

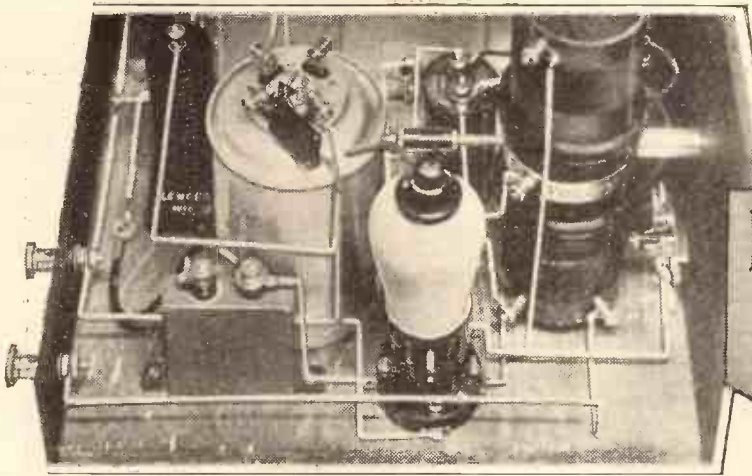
No, I don't think so. If you want to bury your earth you had better do so in the garden, where it can be kept damp without injuring the health of your family.

But I doubt whether in your case you can better the present water-pipe arrangement.

DO YOU USE ONE?



Do you earth your aerial when the set is not in use? A good double-pole change-over switch connection, as above, is a safeguard in the event of a storm.



H.F. HINTS and TIPS

Why let the high-frequency side of your set mystify you, when it is really quite easily understood.

SCREENING S.G. CIRCUITS.

J. G. (Fulham).—"I understand that with an S.G. valve feed-back from the anode circuit to the grid circuit is prevented, and if this is so, I fall to see why it should be necessary to provide metallic screening between the various stages."

No! In a screened-grid valve the feed-back between anode and grid is prevented, but not the feed-back between anode circuit and grid circuit components, unless these are screened.

Take it this way. Fig. 1 is a three-electrode valve and has tuned circuits L_1, C_1 and L_2, C_2 —unscreened.

There will be feed-back—never mind how—so first let's screen L_1, C_1 and L_2, C_2 . It will be found that there is still feed-back.

How? Between anode and grid of the valve by the little capacity formed because grid and anode are close to one another.

We must stop all feed-back. How? By putting a screen between anode and grid, hence the screened-grid valve with screened coils stops all feed-back.

SHOULD SCREENS BE SOLDERED?

C. W. (Winchester).—"I am building a set consisting of an S.G., detector and 1 L.F. stage. The H.F. stage is mounted in a copper box, but it has been necessary for me to extend the screening on one side of this box. This additional screening merely takes the form of a piece of copper bolted to the side of the box.

"Will merely bolting this copper to the box be satisfactory, or would it be advisable to solder the two together so as to make perfect metallic contact?"

Bolted screening is not perfect screening unless it brings the surfaces into really good contact all the way, when, of course, it is the same as soldered screening. But perfect screening is not always necessary. If you have a high amplification per stage,

or if it is necessary to keep circuits very accurately matched (or ganged), then screening plays a very important part.

I know of a set where the lid is bolted on by means of a great many small screws. The designer found this necessary because the results were altered before he fitted these many screws simply by leaning on the top of the box.

In other designs, rough screening is quite satisfactory. There is no hard-and-fast rule. If you want to be sure, solder or bolt with lots and lots of bolts.

G.B. FOR S.G. VALVES.

L. H. W. (Streatham).—"I have often noticed that a small $1\frac{1}{2}$ -volt bias battery is used in certain circuits to bias the S.G. H.F. valve. When is it necessary to use this battery?"

It just depends on the characteristics of the valve and its conditions of working.

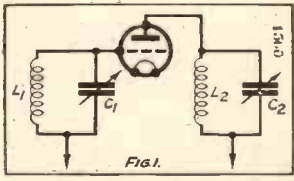
Some valves require this battery, some don't; some do with such-and-such an applied voltage, etc., some don't. Consult your valve makers if you cannot read the characteristic yourself.

A FINE CONTROL OF VOLUME.

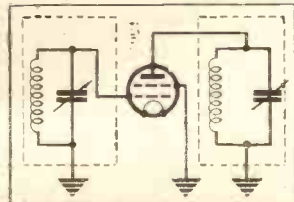
F. D. (Luton).—"I have noticed in several modern designs that where a potentiometer is employed to control the screening electrode voltage of the S.G. valve, a further fixed resistance of from 25,000 to 50,000 ohms is connected in series with the positive end of the potentiometer. What exactly is the function of this resistance?"

The connection gives you a finer control over the voltage.

Suppose you have an H.T. of 200 volts, and this is "dropped" entirely through the potential divider, then, assuming the potential divider to be linear (which it is not, but the



An unscreened circuit of this type will oscillate.



In this circuit the tuning coils are screened, and the S.G. valve prevents "feed-back" between the anode and grid. In practice, of course, the various batteries are included.

H.F. Hints and Tips—Continued.

principle holds), 36 degrees of movement would give 20 volts change.

But if 150 volts is "dropped" in the fixed series resistance, then 36 degrees of movement gives you 5 volts change, and so there's a finer control.

These purely "in principle" calculations neglect the effect of the load taken by the screening grid itself, but, as I keep saying, the principle holds.

Again, of course, you don't waste so much current

because, with a given make of potential divider, the total resistance across the battery is greater than if no fixed resistance is used.

METAL PANEL FOR SHORT WAVES.

G. G. (Hendon).—"Do you consider a metal panel has any advantages for short-wave reception? I have heard so many conflicting opinions that I am quite undecided as to what to employ on my new S.W. set."

Yes, I do like a metal panel, all things considered.

One cannot lay down hard-and-fast rules, and say that unless everything is shielded no short-wave receiver will ever work; but one can say, in principle, shielding is very much to be desired, and in certain cases is a prime necessity.

Thus, as a metal panel is a convenient shield in conjunction with other shielding, it is for that reason to be preferred. Then, again, there is hand-capacity effect; and, while there are other ways of eliminating this, what is easier than a metal panel?

THE "BROOKMANS" REJECTOR.

A. P. W. (Hatfield).—"Why is it that with a tapped aerial coil in my detector and L.F. a 'Brookmans' Rejector is quite effective, and yet with direct aerial coupling, instead of eliminating the unwanted station, it merely alters its position on the tuning dial?"

On this page you will see the two diagrams. In Fig. 1 the rejector rejects, in Fig. 2 it doesn't.

Now the rejector works because it puts a very high impedance in series with the aerial, and all the volts of the unwanted signal should appear across rejector terminals. But this will not happen if there are two very high impedance circuits in series, because, if they are of equal impedance, half the total volts will appear across each.

In Fig. 1 the apparent impedance of the rejector to a given signal is far greater than the apparent impedance of the few tapped turns. In Fig. 2 the apparent impedance of the rejector to a given signal is about equal to the apparent impedance of the whole closed circuit, if that circuit is tuned to the particular frequency you want to reject, hence the rejector is ineffective.

It's a bit complicated, but it's true!

H.F. ON SHORT WAVES.

H. A. L. (Charlton).—"I want to build a very efficient short-wave receiver, and I notice that most of the published designs are of the Det. and L.F. variety.

"I would like, if possible, to use two H.F. stages, but my friends tell me that this cannot be done, because on the ultra-short waves an ordinary H.F. stage becomes very inefficient, and does not magnify at all. Will you please tell me whether this information is correct?"

I am perplexed enough to build a sensible, stable, calculable, easily handled 2 H.F. set for frequencies of 1,000 kilocycles. I shudder at the thought of 15,000 kilocycles!

No! Leave it alone. You can't get anything out of it if you try. The best way for simplicity is, as your friends advise, Det. and 2 L.F. stages.

But if you are ambitious, design a super-heterodyne using 2 H.F. in the intermediate amplifier. That ought to be sensitive, although I should hate to pick up more of short-wave distortion than I do!

THE BIG NOISE—A VERY INTERESTING QUESTION.

A. A. C. (Chigwell).—"I cannot understand why it is not possible to design a set employing ten or twelve valves and, by so doing, increase the sensitivity to such a point that every station in the world will come in at full loudspeaker volume.

"Surely, if the addition of a single H.F. valve gives greater range and volume, there is no reason why one should not go on adding three or even four S.G. valves with the object of obtaining super-range and super-volume."

THIS ONE WORKS

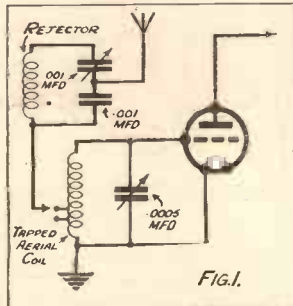


Fig. 1.

Compare this circuit with Fig. 2 when you read the reply to "A. P. W.," of Hatfield.

IMPEDANCES IN SERIES.

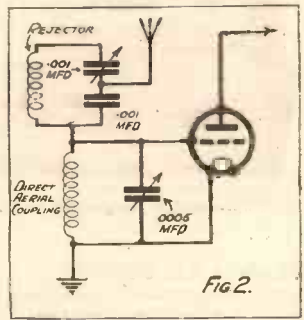


Fig. 2.

This arrangement is vitally different from Fig. 1, although appearing very similar.

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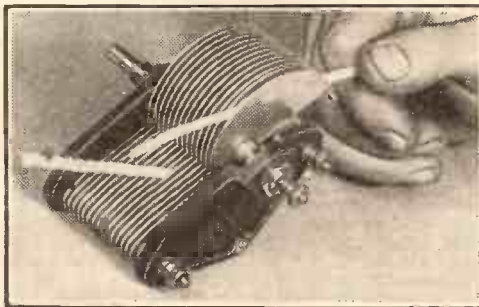
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THAT NOISY BACKGROUND.



Don't allow any dust to collect between the vanes of your condensers. It may cause trouble. A pipe cleaner will easily remove all traces.

H.F. Hints and Tips—continued

What would happen if you tried to hear a community singing concert in Hyde Park if you were in Regent's Park, a mile away? You wouldn't hear it!

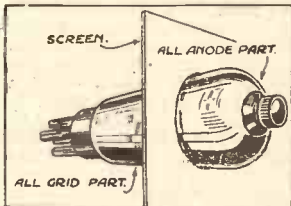
But suppose you got a microphone and a ten-valve amplifier, and magnified your Regent's Park sensitivity 10,000 times?

You might hear the community singing but I should be sorry for you if a taxi tooted twenty yards from that microphone. And the roar of London! And a local sparrow or a cat sneezing on a local roof! What a row there'd be. Not much pleasure listening

to that singing—it would be all drowned by the other noises!

No! The excellence of communication is determined by one simple ratio, the ratio of the intensity of the sounds you want to hear to the intensity of the sounds you don't want to hear.

TO OBTAIN EFFICIENCY



S.G. valves of the non-metal coated types are usually more effective when placed through a hole in a screen.

If a station is weak, but there are no atmospherics or local trams or refrigerators or lifts, then you can magnify that station to full volume; if a station is very, very weak, but stronger than the interference, then your own set starts making a noise in itself, and you will get a roar drowning the very, very weak station.

If the station is strong but the interference strong, too, you must magnify interference and station together. You can never separate them.

Short-wave technique in communicating with the Antipodes is only successful because the atmospherics are very weak with short waves. No other reason at all.

The excellence of a communication by sound, by telegraph, by broadcasting, by anything, is only determined by the signal strength to noise ratio.

A QUESTION OF SCREENING.

P. M. (St. Ives).—"I have been rather puzzled as to why in some sets the S.G. valve is placed through the screen and in others it is merely placed vertically by the side of the screen. Is there any hard-and-fast rule as to why it is placed through the screen in some cases and not in others?"

If you are speaking of non-metallised valves, more complete screening is obtained by poking the valve through a screen as shown.

But sometimes the screening does not have to be so complete as to warrant all this trouble.

If you are not using metallised valves, I should prefer you to use the best screening—S.G. valves want a lot of watching!

CUTTING OUT TWIN PROGRAMMES.

G. B. W. (Potters Bar).—"From my address you will see that I am only a mile or so from the Brookmans Park transmitters.

"I have tried several sets, but in each set the same old trouble has occurred. If I use some form of wave-trap to eliminate these stations, then the set is totally incapable of receiving other stations. If I construct

a five-valve set, with three fully-tuned circuits—2 H.F., det., and 2 L.F.—do you think that sufficient selectivity will be obtained to solve the Brookmans Park trouble?"

"Naturally, the set would be totally screened to eliminate any direct pick-up, and the smallest possible aerial used.

"Assuming that two H.F. stages are to be used, should I use two neutralised H.F. stages, two S.G., or one of each?"

You people give me some lovely problems!

I think you should easily get long-wave stations, in spite of your proximity to Brookmans Park, with quite conventional design. I have done this myself with quite a few conventional commercial sets.

But medium waves do get wiped out. Your method of attack seems sound, but I believe a super-het. would be the best proposition. Start with a coupled circuit between aerial and input. Use a series-tuned circuit in the aerial feeding into a parallel-tuned circuit across grid and filament of a screened grid valve.

Use low-loss coils. Use decoupling everywhere. Use absolutely perfect screening. Then apply the super-heterodyne principle and a coupled circuit to get the hand-pass effect in the long-wave circuit. I think that should do it.

SHORT WAVES AND HAND CAPACITY.

K. E. S. (Kensington).—"I have in use an all-wave set which gives excellent results on both the medium- and long-wave coils. On the short waves, however, the set suffers badly from hand-capacity troubles.

"Why should the set be quite free from hand-capacity troubles on the normal wavelengths, and yet suffer from hand-capacity troubles on the low waves?"

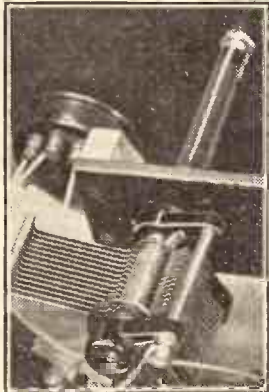
As the wavelength on which you wish to receive becomes shorter, the frequency gets greater. Thus a wavelength of 30 metres has a frequency of ten million alternations per second.

Now a condenser has an effect which is proportional to the frequency, and obviously when you come to this very high frequency the effect of stray capacities is greater than at lower frequencies.

There are several ways of getting over the trouble. Screening is one, and if you are building a detector and 2 L.F. stages you can easily enclose the high-frequency circuits in an earthed metal box, connecting the moving vanes of the condenser to that earthed metal box, when your hand will not make any effect provided the screening is carried out properly.

Some people (not wishing to bother the tinsmith) put a long ebonite handle on to the condenser and prevent hand capacity that way.

"REMOTE CONTROL"



This is an example of how a long handle can be used to minimise hand-capacity effects.



WORKING IT OUT

Figures and formulae that sometimes appear very frightening become as clear as daylight when they are dealt with in this way.

CALCULATING HOME-MADE CAPACITIES.

M. O. (Leicester).—"I wish to try my hand at making some fixed condensers. Will you please give me a simple method of working out the various capacities—one not involving a knowledge of mathematics."

What do you mean, "not involving a knowledge of mathematics?" You must surely want a formula? And can you work this out if I give it you? I assume so.

If you have (n) flat plates of area (A) and distance apart (d) as shown in my figure, then the capacity is given by the formula.

$$C = 0.0885 \frac{EA(n-1)}{d} \text{ micro-microfarads.}$$

E is the dielectric constant which has a value 1 if the space between the plates is filled with air.

If you are to use grease paper, mica, etc., you must find out from the makers the dielectric constant and use it in the above formula. All dimensions in the above formula are in centimetres.

I am sorry if this is too involved, but it's the best I can do.

IMPEDANCE OF AN IRON-CORED CHOKE.

N. S. (Leyton).—"How is the impedance of an iron-cored choke determined for any particular frequency?"

Let the inductance be L. Let the frequency be n. Then the impedance will be $X = 6.28 \times n \times L$, where n is expressed in cycles per second, L in henries, and X in inductive reactive ohms.

Thus the reactance of 2 henries at 100 cycles is $6.28 \times 100 \times 2 = 1,256$ ohms.

CONDENSERS IN SERIES.

L. V. (Huddersfield).—"What is the formula for working out the value of two condensers in series? I desire to connect a .0003 reaction condenser to a .001."

Let C_1 equal the capacity of the one condenser and C_2 the capacity of the other, then C the final effective capacity is equal to

$$\frac{C_1 \times C_2}{C_1 + C_2}$$

Thus a .0001 condenser in series with a .0003 condenser is

$$\frac{.0001 \times .0003}{.0001 + .0003}$$

which equals .000075.

A useful rule to remember when connecting two condensers in series is that the total capacity is equal to "the product over the sum." That is, you multiply the two capacities together and divide by the result of adding them together. You can't apply this simple rule for more than two series condensers.

FREQUENCY AND WAVELENGTH.

B. H. (Cricklewood).—"The European stations are, I believe, separated from each other by 9 kilocycles. The wavelength represented by 9 kilocycles is, according to my reckoning, roughly 30,000 metres. Midland Regional, however, is undoubtedly not separated from Bucharest by 30,000 metres, although the stations are 9 kilocycles apart. What is the snag?"

There is no snag!

The fundamental formula for a wave-motion is that the wavelength multiplied by the frequency of the disturbance making the wave is equal to the velocity of travel of the waves through the medium.

If γ is wavelength, n frequency, and C velocity, then $\gamma = C \div n$.

Now, for wireless, the velocity of the waves is 3 with ten noughts after it centimetres per second. From this it follows that a wave of length 300 metres is set up by aerial circuits having a frequency of one-million. Thus:

Wavelength	Frequency
300,000	1,000
30,000	10,000
3,000	100,000
300	1,000,000
30	10,000,000
3	100,000,000

Now let us add, for the sake of argument, 9 kilocycles to the frequencies 1,000, 10,000, 100,000, etc., and see what wavelength results, and see also the difference in wavelength at each frequency.

Wave-length	Frequency	Frequency 9 k.c. = f_2	Wave-length corresponding to frequency f_2	Changed wavelength by adding 9 k.c. at given wavelength
300,000	1,000	10,000	30,000	Metres 270,000
30,000	10,000	19,000	15,789	14,211
3,000	100,000	109,000	2,751	249
300	1,000,000	1,009,000	297.3	2.7
30	10,000,000	10,009,000	29.997	0.027
3	100,000,000	100,009,000	2.9997	0.00027

You will see (and it's been a labour of love doing this table!) that the difference in wavelength for a 9-k.c. change in frequency depends upon the wavelength at which you add (or subtract) the 9 k.c.

At 300 metres adding 9 k.c. makes only 2.7 metres difference; at 30,000 metres it makes 14,211 metres difference! Hope you see the point!

On very long waves there appears to be no selectivity. Suppose you try to "read" a station on 30,000 metres. Another stronger station "jams" you. That interfering station may be on 14,211 metres, which seems a long way away, but is really only 9 k.c. "off tune."



SOME FACTS



ABOUT CONDENSERS

In every set condensers play an important part, and here are some helpful facts about their various uses.

DO CONDENSERS CONDENSE?

B. P. (Tring).—"I do not understand why a condenser should be so named. What does it condense?"
If you hang up a flat plate of conducting metal and fill that plate with electrons, you are said to make that plate negatively charged.

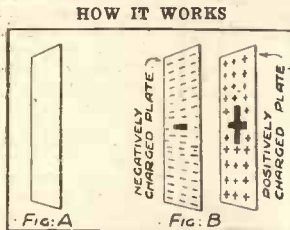
Fig. A shows the plate. Now I have taken away a lot of electrons from a second insulated plate, which is said to be then positively charged. I bring the two plates near to one another, Fig. B.

Now (+) attracts (-), so all the electrons in the first-mentioned negatively-charged plate concentrate upon the surface of the plate, attracted towards the positive plate. So the bringing-of the two plates near to one another—one negative the other positive—has condensed the charge upon the surface of the plates.

The term condenser was invented in the early days of electricity long before wireless came. It has remained with us.

A condenser exists in a wireless set as a component of an oscillating circuit designed to allow that circuit to oscillate at a frequency determined by the value of the condenser, that is, by the strain of the charges pulling towards one another in the surfaces of adjacent plates.

The strain value is varied according to the area of the plates which are actively facing one another.



This pictorial diagram illustrates the action of a condenser when the plates are charged.

UNEXPECTED RECEPTION.

H. T. W. (Dundee).—"Why is it that since connecting large fixed condensers across my H.T. battery to prevent battery noises, I find that after the set has been switched off signals can still be heard for several seconds? Does this indicate that the condensers are faulty?"

On the contrary, it indicates that the condensers are very good. For the purposes of this explanation it is fair to think of electricity as being carried by little particles called electrons.

An H.T. battery is a method of making one side of the battery (the positive) deficient in electrons; the other (the negative) holding a surplus.

Now, if you connect a condenser across a battery all the electrons surplus to establishment will collect on the plate connected to negative and the positive pole of the battery will suck out all the negatives in the top plate of the condenser and push 'em round and into the negative.

That's what a battery does, it sucks out from the

positive and pumps into the negative. But the condenser negative plate soon gets full and you cannot pump any more electrons into it—we say it holds a charge of electricity.

Now, if we have a "load" R across the condenser, the battery keeps the charge on the condenser, and supplies a current through the resistance as well, because the battery is always maintaining the disequilibrium of electrons, and these are struggling always to reattain their equilibrium.

Now, if we cut off the battery at X the electron flow from the battery ceases, but there is still a supply stored up in the condenser. Until the condenser has as many electrons in one plate as in the other, the current through R will continue—diminishingly.

If we put the switch at Y the current will cease at once; you try putting the switch there, as an experiment, and see. You can take a condenser, put it across a battery for 5 seconds, take it away from the battery, and then short-circuit the condenser, when there will be quite a gratifying spark.

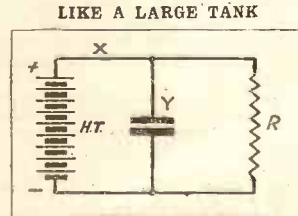
It's not very good for the condenser, but try it once or twice.

DIELECTRIC LOSSES.

H. T. N. (Weybridge).—"I have noticed that, in a number of compact receivers, tuning condensers of the kind having a dielectric of the paxolin type between the condenser vanes are used, instead of the usual type with air dielectric. Would not the use of this type of condenser reduce efficiency and tend to cause flat tuning?"

I do not know the numerical figure expressing the dielectric losses introduced by the use of this material. I should guess that the losses are considerable compared with those inevitable in a compact coil, and I am sure that by the use of retroaction the ultimate efficiency of the circuits is close enough to that of other circuits possessing air dielectric condensers.

Realise that in most receivers a turn of the reaction handle makes the difference of two stages of high frequency in selectivity and sensitivity and that, in face of these enormous changes, the little inefficiencies make very little difference.



In dealing with "H. T. W.'s" query Capt. Eckersley explains that a condenser connected across a battery acts like a tank and accumulates a store of electricity.

NOT SO DUSTY!

A. G. (Walkerville).—"I have been told that particles of dust between the vanes of a variable condenser

Some Facts About Condensers—continued

reduce the efficiency of a set and tend to make it noisy in operation. Is this true?"

Yes; if the dust is metallic or conducting dust. I have never really made much study of the conductivity of average dust.

But, of course, dust, if it is non-conducting or a dielectric, could by scratching about make some effect. It's much best to keep things clean in any case and keep dust away from condensers, but if you don't want to box everything, a pair of bellows makes a fine investment; and you can have great fun blowing the dust off your set on to your chairs and tables and waiting for the dust there deposited to come back to your set!

Most of the big wireless stations are periodically cleaned by blowers, and in accurate wave-meters the condensers are washed out by petrol. So keep things clean; it won't do any harm.

NON-INDUCTIVE OR MICA ?

E. J. R. (Dovercourt).—"Recently a number of manufacturers have produced non-inductive coupling condensers. Would there be any advantage in using this type of condenser for coupling purposes in the R.C. stage of my set—as against my present mica?"

I think the non-inductive type of condenser was produced largely for high-frequency decoupling, wasn't it?

In any case, if you've got a mica condenser for R.C. coupling you cannot do better. Lucky man!

So many people use those other paper condensers, and, while they are perfectly good for fairly low-voltage work, I always like a high-voltage type of good mica condenser.

CAPACITY FOR SHORT WAVES.

M. K. C. (Eltham Park).—"I understand that in order to tune satisfactorily on the ultra-short waves a small tuning condenser is essential. My set has a .0005-mfd. condenser. Can I place a .0005-mfd. fixed condenser in series with it to reduce its capacity, and so obtain the same effect as a .00025-mfd. variable condenser?"

Not quite. A variable condenser does not, if a fixed series condenser of its maximum value is connected in series with it, behave all the way round as a halved variable condenser.

Two variables ganged and placed in series would give a halving effect all the way round. But for ultra-short waves, surely you want to do more than halve the condenser value.

THE LEAKY-GRID DETECTOR.

H. G. (Falmouth).—"I should be glad to know the effect of using different values of grid condenser for the condenser in a normal leaky grid detector. So far as I can determine by experiment, alterations between about .001 mfd. and .0001 mfd. make no noticeable difference to results."

The condenser in a leaky grid detector arrange-

ment exists to form a path for the high-frequency current into the grid circuit. But the condenser, if too large, would shunt the low-frequency variations of potential on the grid to earth.

So this condenser must not be too small or too big. I should say that there were actual changes going on which do affect the result if you vary the condenser as 10/1, but if you cannot appreciate these changes they must be of a second order magnitude.

Really, of course, it's not only the value of the condenser alone which determines performance; there's the grid leak as well.

A WINDOW-PANE CONDENSER.

P. W. H. (Ipswich).—"I have been told that it is possible to make an aerial lead-in connection by pasting a piece of silver paper on the outside of the window, and a further piece of silver paper on the inside. The actual aerial has to be joined to the sheet of tinfoil on the outside, and the aerial lead of the set has to be joined to the piece of tinfoil on the inner surface of the glass in the window-pane.

"Seeing that this will act as a condenser, can you suggest a suitable size for these two pieces of tinfoil?"

The ingenious method of leading in an aerial by forming a condenser on the window-pane is perfectly practicable. As to the sizes of the pieces of paper, it all depends on the value of condenser that is suitable.

I could calculate it all out, because there is a formula which involves the area of the plates and the distance between them, and the dielectric constant of the window glass; but I am going to be rash and make a guess and say that a size of 6 in. x 6 in. square would make a big condenser, and would not alter the tuning of your set. A size of 3 in. x 3 in. would be quite efficient.

I hope I am about right because it is a pure guess and I have not worked it out. If the tuning is very much altered using the size I propose you will need to get bigger pieces of tinfoil.

METAL OR EBONITE ?

E. P. (Weymouth).—"Some tuning condensers are made almost wholly of metal, while others have 'end-plates' of some such insulating material as ebonite. Are the two types for different purposes, and when should either one be chosen?"

I should choose a condenser with the best possible mechanical construction, and I should make sure that any insulating material really *was* insulating material and not "muckite," particularly if that material was anywhere subjected to a concentrated electric field.

Apart from these factors, metal or ebonite end plates are equally good, although sometimes a lower minimum capacity is achieved with an ebonite end plate.

FOR CONSTRUCTORS



After you have marked off the dimensions on the back of the panel, take a nail or a centre-punch and make a dent at the point where the hole is to be drilled. This stops the drill from wandering.



On these pages Capt. Eckersley clears up some of those knotty points which are apt to bewilder those interested in the working of a radio set. And there is nothing of the text-book nature about his explanations!

HOW ALTERNATING CURRENTS FLOW.

W. J. R. (Bexhill).—"Having seen in a text-book that alternating currents flow first in one direction and then in the reverse direction, I find it difficult to understand the exact manner in which the current flows. Does the current flow straight along the wire, as the normal illustration shows, or from one side of the wire to the other as the polarity changes?"

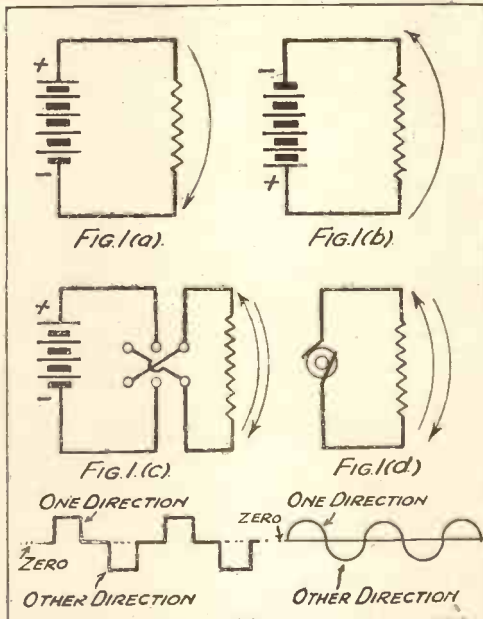
I don't quite understand your question, but surely the matter is very simple. Please see my diagram.

In Fig. 1a, let us say for the sake of convenience, that a current flows through the resistance R from plus to minus. Now, if I reverse the battery, as shown in Fig. 1b, the current flows in the other direction through the resistance, as indicated by the arrow.

If I were to arrange, as shown in Fig. 1c, a double-pole change-over switch, cross connected as shown, then the current could be made to flow first in one direction through the resistance, and then, by throwing over the double-pole switch, in the other direction, and you would have a sort of alternating current (with a rather bad wave form!)

I have drawn below Fig. 1c the direction and intensity of the current if the switch is thrown over. An alternator does not reverse the current abruptly, but gradually, and in Fig. 1d you will see, below the drawing of the alternator, and the resistance, the shape and direction of the current-time curve, called a sine curve. I hope the matter is now perfectly clear to you.

WHAT IS A.C. ?



Read the easy-to-follow explanation of alternating current given to a Bexhill reader.

when a high voltage is applied to them. Or is there really a definite distinction between insulators and conductors?"

An insulator is really only a poor conductor. For instance, if you take a porcelain insulator with sulphur held in metal caps on top, the ordinary bolt screwed up into its skirts, and then you apply high-frequency (say 1,000 kilocycles) at, say, 20,000 volts with a kilowatt power, in a few minutes the sulphur begins to melt and soon may burst excitingly and damagingly.

If, however, you took that same insulator and put D.C. at 20,000 volts and a kilowatt) upon it, it would hold up for ever.

Actually the high-frequency made the porcelain conductive, and it was the current passing through the porcelain which heated it and exploded it.

The idea in designing insulators is two-fold: (a) to minimise large electric field densities; (b) to make the path between electrodes a surface rather than a through path. Thus you may see large metallic rings on wireless aerial insulators to distribute the field, and you will always see an attempt made to make the surfaces very smooth and shiny and to keep them dry, by using "skirts."

GRID-LEAK DETECTION.

J. M. (Gidea Park).—"I find that a milliammeter connected in the plate circuit of the leaky-grid detector of my set reads 5 milliamps, when the set is not tuned to any station. When, however, I tune in either of my local stations the reading falls to between 3 and 4 milliamps.

"Is this in order?"

ALL ABOUT INSULATORS.

W. E. (Ware).—"Is it true that under certain conditions insulators become conductors? For example,

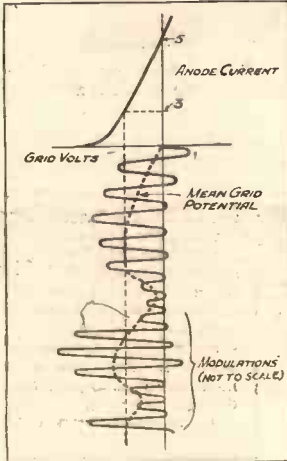
P.P.E. Explains—continued

It is "in order"—in degree if not in quantity. A leaky-grid detector works in this way:

1. Before signal the valve passes (say) 5 milliamps, just like a good valve will.

2. A carrier (not modulated) is tuned in. Analyse it very slowly. First, there is a positive grid swing, then a negative, then a positive, and so on. At the first positive swing electrons flowing past the grid got attracted to the grid because that grid is negative.

DETECTOR ANODE CURRENT



With the aid of this diagram Capt. Eckersley explains to J. M. why the anode current of a grid leak detector falls when a station is tuned in.

reduces from 5 to, say, 3 milliamps.

But if we modulate the intensity of the carrier wave the mean grid potential changes according to the modulations, and we thus get rectification. But if we reduce the mean grid potential too much we get bad quality because we start going round the negative bottom bend of the valve characteristic.

So it is better to let the carrier wave reduce the current by about 10 to 15 per cent., no more in usual practice.

VOLTAGE OUTPUT FROM RECTIFIER.

B. G. (Highgate).—"I have a transformer intended for an H.T. eliminator. The secondary side has an H.T. secondary centre tapped and an L.T. secondary centre tapped.

"Which of the two following schemes will give me the greatest output? A full-wave rectifying valve connected in the conventional manner to this transformer, or a full-wave valve with the plates connected together, and the whole of the H.T. secondary used for half-wave output.

"When referring to output I really mean the highest voltage output."

Obviously, the high tension will be greater with the single-wave than with the double-wave rectifier.

I have drawn two diagrams assuming that the transformer has voltages as shown. Obviously, twice the voltage is given with the single-wave rectifier, than with the double-wave rectifier as you propose to connect them.

3. The grid goes negative and the negative charge remains on the grid, only slowly leaking away.

4. The grid goes positive again and collects some more electrons. But not so positive as before, because it already carries a lot of electrons.

5. The same as 3.

6. The same as 4.

Look at the diagram. This shows the momentary potential of the grid during several swings of the carrier-wave potential.

Note that after a few swings taking only a few millionths of a second, the whole grid potential has gone negative—steady negative, and so the current

If you are connecting a given load, then the single-wave rectifier will require more emission from the valve than from the double-wave rectifier, simply because the current taken by the load will be doubled if the volts are doubled (This, of course, is not quite right owing to other considerations, but I am talking of the simple theory.)

A very simple way to look at rectification is to consider a pump gulching water into a tank.

You want to maintain even flow from the "flow out," and have, therefore, got to make the "flow out" so restricted that the water keeps up to a steady level. Thus, never ask the rectifier to deal out more than is fed in.

If you do, the level in the tank will be always surging up and down, giving surging "flow out" (or, in electrical practice, a hum). You could either make two flow-ins as shown, squirting alternately smaller gulches, or one single flow-in squirting much larger gulches.

That is the difference between single-wave and double-wave rectification. There is no difference between the two provided there is sufficient flow-in in each case and, of course, a sufficiently large tank which is the condenser.

The pressure is always constant provided the flow-in is sufficient to cope with the flow-out.

I hope this answer is clear.

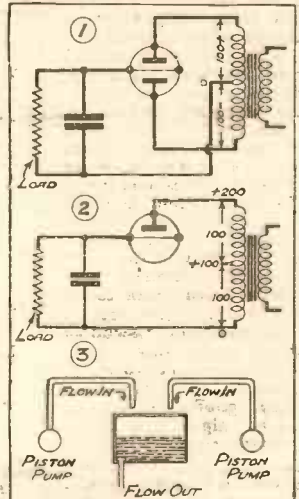
HARMONICS IN A SUPER-HET.

L. T. (Nottingham).—"I am very interested in super-heterodyne receivers, and I have heard my friends speaking of oscillator harmonics. Do these harmonics affect the working of a super-het? If so, how can they be eliminated?"

If the oscillator of a super-het. has harmonics, these may beat with unwanted transmissions and so produce jamming. Thus, suppose you want to pick up a station transmitting at a frequency of 600,000—your intermediate frequency is, say, 100,000—then your beat oscillator must be adjusted to 700,000 (or 500,000). [Thus 600,000—500,000 = 100,000 = 700,000—600,000.] But if your beat oscillator gives a frequency of 1,400,000 (or 1,000,000), then that frequency may beat with a station at 1,300,000, or 1,500,000 or 900,000 or 1,100,000, and all produce 100,000.

So don't have harmonics in a super; get rid of them by keeping a good, steady negative voltage on the grid of the oscillating valve. And do not use a grid leak to do it; use a battery—in fact, a free grid bias will do.

WHAT IS RECTIFICATION?



A sketch which illustrates the reply to B. G., Highgate, on the subject of rectifier output.

Thus, suppose you want to pick up a station transmitting at a frequency of 600,000—your intermediate frequency is, say, 100,000—then your beat oscillator must be adjusted to 700,000 (or 500,000). [Thus 600,000—500,000 = 100,000 = 700,000—600,000.] But if your beat oscillator gives a frequency of 1,400,000 (or 1,000,000), then that frequency may beat with a station at 1,300,000, or 1,500,000 or 900,000 or 1,100,000, and all produce 100,000.

P.P.E. Explains—Continued

SHOULD THE NEEDLE BE STEADY ?

T. C. L. (Harrow).—"I have connected a milliammeter in series with the anode of my last valve, and the current reading is approximately 15 milliamps. I find that when I am receiving signals the needle fluctuates about 2 milliamps on either side of the mean value, and on very loud passages it sometimes gives a violent kick."

"I cannot hear any appreciable distortion, and I should like to know whether the needle should remain absolutely steady all the time broadcasting is coming through."

In a straight (as opposed to push-pull) connection the plate milliammeter should, strictly speaking, remain sensibly still. Think of a set of anode-current anode-volt characteristics, as shown in my diagram.

Suppose before the signal arrives there is (a₁) milliamps at (b₁) volts. Now, the grid voltage is varied from, say, 6.5 to 0, and back from 0 to 13, and if the anode impedance is about right (given by the slope of the line X P Y), the current increases to a₂, and then decreases to a₃ and back to a₁. The volts change from b₁ to b₂ and to b₃, and so on. The mean current, a₁, does not change, and everything is symmetrical. But now suppose we increase the grid swing from +3 to -21. Obviously, there is no current after -16, and yet there is increased current after -3, and so the mean current rises. But the positive excursion has resulted in more energy being supplied than the negative excursion, and so the loudspeaker is supplied with more positive kicks than negative. This means that the A.C. component of the current looks like the curve at the lower part of the diagram.

This inevitably results in the introduction of harmonics and distortion. If there is already some distortion this may not be noticeable, but it is a bad sign and should be eliminated.

THESE VARIABLE SHORT WAVES.

R. O. L. (London).—"I have recently been carrying out a certain amount of short-wave reception on a three-valve short-waver. I find that on some nights reception is very good, whereas on other nights practically nothing can be heard."

"This is not due to a fault in my set, and I should be grateful if you could tell me why conditions should vary so much?"

We must get you to understand the Heaviside Layer. Have you ever asked yourself why it is that you can signal by wireless to the Antipodes?

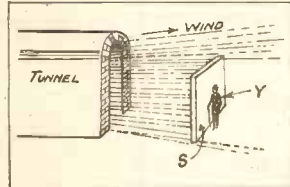
We have always known that "rays" go straight; and so, obviously, rays shoot along the ground. But the world is curved, so they leave the ground and go on, and would appear to shoot off into space for ever and for ever,

If there was nothing to deflect them back again on to the earth they would disappear and we should not be able to signal the Antipodes or even America by wireless.

But fortunately there is a layer of electrified particles or a multilayered arrangement of electrified particles, called the Heaviside Layer, which bend the rays back again.

The Layer's reflective powers depend upon: 1, wavelength; 2, time of day or night; 3, season; 4, world path; 5, momentary structural changes; 6, sunspots and magnetic and electric atmospheric states. So no wonder things vary a bit!

WHY IS HE SCREENED ?



Little Mr. Y is right opposite the mouth of the tunnel, but does not feel the wind. This is analogous to the effect mentioned by S. B.

A CURIOUS SHIELDING EFFECT.

S. B. (Seven Kings).—"My house is, I believe, roughly sixteen miles from the Brookmans Park transmitter, and I always imagined that, at this distance, one's reception was almost entirely due to the transmitter's 'direct ray.'"

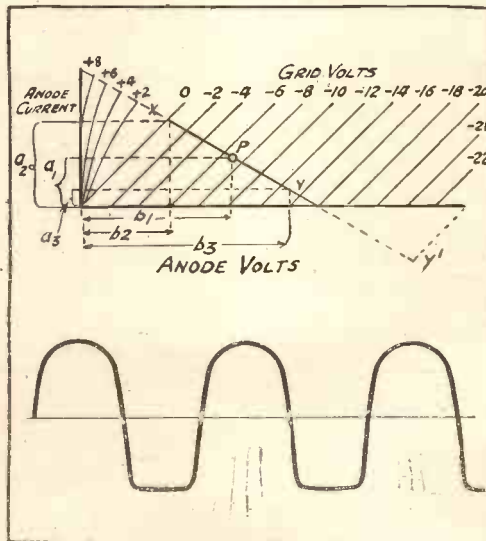
"During the daylight hours, however, I find the National programme noticeably weaker, and with nightfall an increase of signal strength occurs. Is this an indication that my aerial is not completely in the 'service area' of the National transmitter at Brookmans Park?"

You should be in the direct ray of the shorter-wave Brookmans Park, but your direct ray service may be locally shielded and you may, therefore, be owing something to the indirect ray. A wind may blow from the mouth of a tunnel as shown in my drawing. You (Y) may be behind a shield (S). The direct wind is not very strong, even though further away from the source of the wind and outside the effect of the shield it may be stronger, and further away weaker.

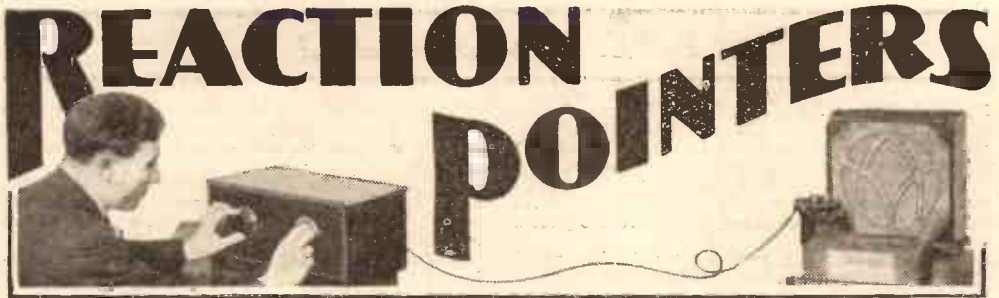
Thus you are in an area of direct ray in your house at Seven Kings, but you may be locally shielded. Even at this distance, the indirect ray is quite strong, and is, in your shielded position, comparable with the (shielded) direct ray.

If the shielding effect was very bad you would be completely cut off from the shorter-wave Brookmans Park during daylight and reception after dark might be subject to fading. Such a state of affairs is very unlikely.

KEEP THE NEEDLE STEADY !



When the needle does not remain steady the curve becomes flattened on one side, as explained in the answer to T. C. L. (Harrow),



Smooth reaction is essential for long-distance working, particularly in circuits without high-frequency amplification. At the same time, receivers of this type should not be allowed to oscillate during broadcasting hours, otherwise serious interference will be caused to neighbouring sets.

AM I OSCILLATING?

S. W. D. (Boscombe).—"How can I tell if my set, a detector and two stages of L.F., is oscillating and causing interference to others? How can I stop the valves howling?"

Oo! Ow! Oh! Oh!!

I think that undoubtedly the best thing for you to do is to write to my erstwhile friends in the B.B.C. Address your envelope to the Chief Engineer, and mark it, "Oscillation," and put the problem as you have put it to me.

Meanwhile do this:

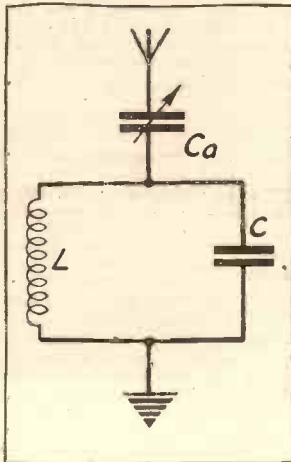
You hear a howl—
Move your tuning dial—

Does the note vary in pitch up or down as you move your dial? If it does, it's you. YOU are ruining the programme for some few thousands of your neighbours. Don't do it! (Please!)

To stop the oscillation? Well, you have a knob marked volume or reaction? Turn it round till the howl ceases. If nothing stops the oscillation—switch off altogether, ask in a knowledgeable friend and he will show you what to do.

But do write to the B. B. C. for

LOOSE COUPLING



The effect of a small series aerial condenser (C_a) is to reduce damping, thus assisting in the application of reaction.

their oscillation pamphlet.

USING A DIFFERENTIAL CONDENSER.

R. T. H. (Bognor).—"Recently, I fitted a differential reaction condenser to the detector valve in my set, and found that it increased the sensitivity as compared with an ordinary reaction condenser, at the same time allowing for smoother reaction control. However, it has occurred to me that the direct by-pass effect offered by the condenser between anode and filament negative of valve tends to cut off the higher frequencies.

"Is this correct, and by what amount is the high-note loss likely to affect quality? I think speech, etc., seems to be very slightly more 'woolly.'"

If you have chosen the right values, I see no reason why there should be serious loss of top due to this effect rather than to the much greater "top-cut-off" effect of reaction itself. I often notice people worry about top-cut-off in detail, and yet apply reaction in gross.

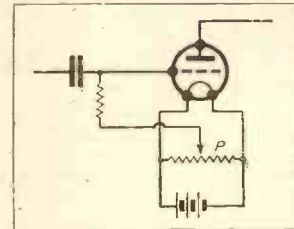
WHEN THE SET GRUNTS.

P. B. (Ipswich).—"I have a two-valve set, detector valve followed by a transformer-coupled L.F. stage. When I attempt to make critical adjustments of reaction in order to tune in Continental stations I get a peculiar grunt, immediately after which the set begins to oscillate.

"I thus find that I cannot get the set at its most sensitive point just before oscillation, which I understand is necessary if long-distance reception is to be obtained. I have tried a different size reaction coil, and also varying the H.T. voltage on the detector valve, but all to no avail. Can you help me?"

If I can assume that the whole circuit is of a conventional kind I suggest that the aerial circuit is of a rather high resistance, or that the reaction conditions are not ideal as regards values of H.T., grid leak (if used), etc.

FOR SMOOTH REACTION



Showing how a potentiometer should be connected to enable the grid potential to be gradually varied.

work more effectively if their grids are biased a little positively. But don't reverse the L.T. battery—use this scheme instead.

P in my diagram is a potentiometer. Obviously, as the slider is moved one way or another more or less "positive" is applied to the grid.

Make P of high resistance (say, 400 ohms) so as not to run down the low-tension battery unduly.

Try a potentiometer if the aerial series condenser does not work.

As, however, you have tried varying circuit constants, I suggest that the aerial is "heavy." If you have got a reasonably good earth and aerial system, try a small variable aerial series condenser, which will effectively reduce the "pull" of the aerial on the circuit.

A great many detector valves

VALVES AND VOLTAGES



Why does a Pentode require an output transformer, and why do valves have glass bulbs? You may not know the answers now, but you will when you have read what Capt. Eckerstey says.

WHEN THE VALVE GETS HOT.

"Perplexed" (Strood).—"How hot should the bulb of a super-power valve get?"

"I am using one of the 2-volt type with 150 volts H.T. and the recommended grid bias. Yet after half an hour or so the glass becomes almost too hot for me to bear my hand on. Is this in order?"

Oh, yes. That's all right. Never be afraid of a little heat.

Catch hold of the bulb of your electric light (one that's doing its duty in a central position, not that one economising for you in the hall), and you'll realise, as the professor said after a discussion on a vexed subject, "it's difficult to get light without heat."

It's difficult to get power without the appearance of heat, vide a lorry of 1912 make carrying a ten-ton load up Kirkstone Pass. Go down to Brookmans Park and see a cascade of water pouring over a grid of pipes and steaming because that water's cooling valves in the station.

A super-power valve has to get rid of a lot of waste heat, because to get some reasonable power into useful form in a loud-speaker a lot of power must be expended in the valve. The heat is due to electrons bombarding the anode of the valve.

PENTODE PERFORMANCE.

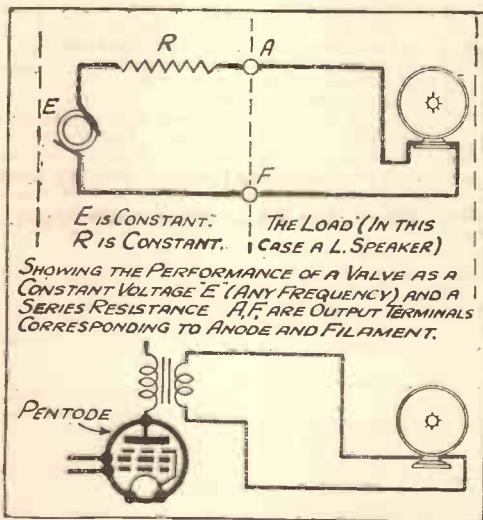
W. G. (Eastbourne).—"Why is the quality of a receiver using a pentode usually harsh and shrill compared to the tone obtained when using an ordinary power valve in the same set?"

There is no necessity for the output of a pentode to be shrill, provided the circuits are correctly designed. The best way to look at the matter is to consider that a valve is an alternator of constant voltage over a range of frequencies having a resistance in series with the constant voltage alternator, the output terminals being from outside of resistance and

one leg of alternator (see diagram), as the impedance of the load (a loudspeaker) is small at low frequencies and high at high frequencies. If you refer to the diagram you will see that if the external load is low, then a lot of volts will be dropped in the resistance, provided the resistance is large compared to the impedance of the loudspeaker. Thus the volts at low frequencies, provided the resistance is large compared to the load (loudspeaker) impedance, across the load is small.

Thus if a valve has a high internal resistance (usually known as a high-impedance valve), its output is small if the load impedance is relatively of low impedance. The pentode has a high impedance and the loudspeaker at low frequencies has a relatively low impedance, and so the pentode output at low frequencies is smaller than at high frequencies and reproduction sounds shrill. The solution is to use a transformer (see sketch) which has a ratio of 2 or 3 or 4 to 1 of anode circuit to loudspeaker circuit windings, so that the load impedance of the speaker to the valve is apparently increased.

WHY IS IT SHRILL?



The diagram illustrates an interesting point about Pentode performance—its tendency to make reproduction sound shriller than with an ordinary output valve.

ELIMINATOR VOLTS.

B. G. (Tottenham).—

"I am using an H.T. eliminator and I am doubtful whether the set is getting the correct voltages. Will you please tell me of a simple method of measuring the voltage from a mains unit, since I understand that the suitable?"

average voltmeter is not

If the meter has a 1,000 ohms per volt characteristic, it will measure the voltage.

If the voltmeter is a cheap one it may have a characteristic of 10 ohms per volt and take 100 milliamps to read 100 volts. Lots of eliminators have a maximum output of, say, 20 milliamps, and so if you try to measure the voltage with a cheap voltmeter your eliminator cannot supply the power to make the voltmeter read!

Valves and Voltages—Continued

UNBREAKABLE VALVES.

E. L. (Cardin).—"Does glass possess qualities making it peculiarly suited for use in valve manufacture?"

"I used to think that a glass envelope was used so that one could see the 'works.' Now, however, the metallic coating on the inside of the valve envelopes makes it impossible to see the electrodes, and it occurs to me that the valve would become a much less fragile component if the bulb were constructed of a more robust material.

"Is there any objection to enclosing the electrodes of a valve in, for instance, a steel cylinder which could not easily become broken with careless handling?"

OHMS PER VOLT



In order to measure mains unit voltages it is essential that a high resistance voltmeter should be used.

great difficulty is that metal, unless made very thin and extremely carefully handled, gives off fresh gas after the valve has been pumped.

Thus, metal valves might be inclined to soften after manufacture. The big, water-cooled transmitting valves are made of metal, of course, but it would be taking unnecessary risks and incurring the expense of special machinery and new research to go away from glass only for the reason that people sometimes drop a valve.

But have you noticed that a dropped valve seldom bursts, and that it's the delicate inside "works" which go awry? So there's no advantage really in the metal valve at all.

MAXIMUM MAINS VOLTAGE.

W. M. H. (London, E.).—"I have been told that with an H.T. mains unit working from 200-volt D.C. mains, the voltage across the output with 'no-load' can only reach approximately 200 volts.

"Yet with A.C. mains of a similar voltage, the output voltage from a mains unit can easily rise to several times the mains voltage, although both units are capable of giving a similar output in watts. Can you explain why this should happen?"

A.C. supply can be "transformed" up to any voltage by a device known as a transformer. This consists of two copper wire windings, separate but wound over the same iron core. In theory, if you have A.C. volts of value X and apply these to the primary winding of a transformer having N turns, then if the secondary winding of that transformer has A × N

turns, the voltage developed across the terminals of the secondary winding will be A × X volts. 100-volt mains—2:1 transformer gives 200 volts in the secondary.

With most transformers a load on the secondary reduces the volts due to losses of all kinds, and so "no-load" volts may be greater than load volts. With D.C. one cannot, without having rotating machinery, increase the voltage beyond that supplied by the mains which, with the loads likely to be used by wireless sets, remains constant.

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THOSE VOLTMETER READINGS.

H. Q. (Carlisle).—"I have read that it is impossible to check the output voltage of an eliminator by using an ordinary voltmeter.

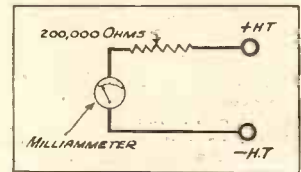
"Since a voltmeter satisfactorily measures the voltage of a dry H.T. battery, it is rather puzzling that the same instrument cannot measure voltages derived from the mains. Why is there this difficulty?"

I have just answered a similar question, and I pointed out that a cheap voltmeter could not measure the volts given by a fairly low powered eliminator. If you've not got a good voltmeter, you can buy one to do it!

If you don't want to buy one you can save money by making one. Get a milliammeter reading to 1 milliamp. Get a 200,000-ohms wire-wound resistance. Ask the makers what they guarantee in accuracy—probably 5 per cent. Then connect the resistance and milliammeter as shown in my sketch.

Then 1 milliamp on the scale reading is 200 volts, with an error of ± 5 per cent—surely sufficient for your purposes? Of course, one can buy electrostatic voltmeters which take no current—and sometimes short-circuit. It's worth while investigating if you can buy an electrostatic up to 200 volts, I suppose, but my other suggestion is good also.

SIMPLE AND ACCURATE

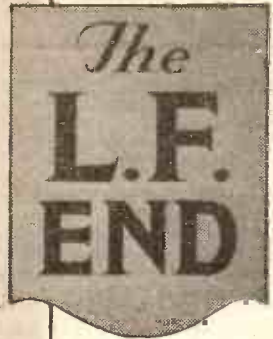
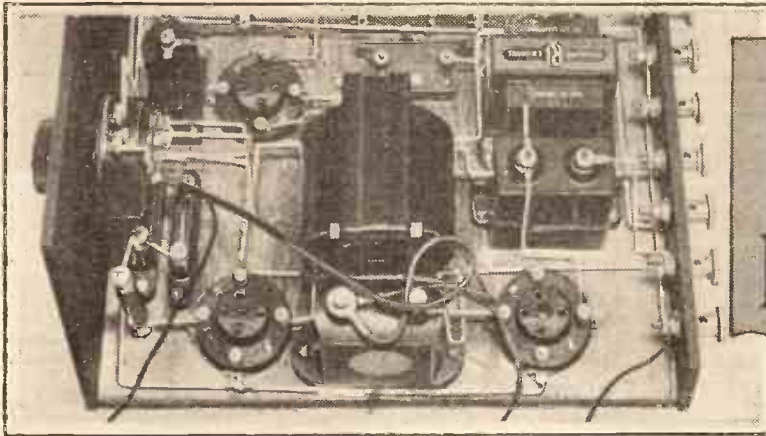


The voltage can be found with great accuracy by noting the current flow as explained below.

THE RIGHT AND THE WRONG WAY



Never pull a valve out of its holder by taking hold of the bulb. The method shown on the right is the correct one.



It is vitally important to get the low-frequency amplifier just right. For example, do you know how an H.F. stopper should be connected, or the values for a heterodyne filter? If not, read what Capt. Eckerley says.

PROS AND CONS OF CHOKE COUPLING.

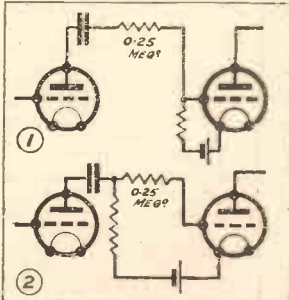
P. C. (Cardiff).—"I notice that choke-capacity amplification is very rarely used these days. I was listening to a set quite recently which had two stages of this form of coupling, and the quality was all that could be desired. Has choke coupling any disadvantages?"

It is true to say that choke coupling has advantages, and disadvantages. The advantages of choke coupling are that one does not drop voltage on the

anodes, because the choke has small D.C. but large A.C. resistance (or impedance, really). But the impedance of a choke varies with frequency, and may therefore give different effects at different frequencies, giving less magnification at low than at high frequencies.

If the chokes are made very high they have capacity effect, and spurious resonances may come in. Furthermore, resonances are set up as between the intercoupling condensers and the chokes.

WRONG AND RIGHT



The top diagram shows the wrong way to connect a grid stopper in an R.C.C. circuit, while the bottom one illustrates the correct method.

However, it isn't all so bad as it sounds if it's worked out practically. Theoretically, there are snags which the R.C. coupling gets over in practice.

Choke coupling is perfectly good if one isn't aiming at absolutely theoretical perfection, and it is handed by someone who understands the quantitative implications.

REMOVING A WHISTLE.

S. L. (Ilford).—"Mühlacker's spacing from London Regional is now eleven kilocycles, according to the published wave-lengths. In spite of this, I can still hear a heterodyne whistle on the Regional.

"Can you tell me how I could cut this out, because it is very irritating to hear this high-pitched whistle in the background all the time?"

There are many, many ways to do this: the best ways are complex and expensive. I think one of the easiest ways is to construct a low-frequency cut-off filter of simple design.

One of the very simplest is to connect a condenser across your loudspeaker unit, but you may remove too much other "top" in doing this.

You can use a connection like the one in my diagram, if you will, using the values shown in the figure.

HOW IT SHOULD BE DONE.

J. J. (Southall).—"When reading an article regarding the use of a .25-megohm grid leak in series with the grid leak of an L.F. valve to prevent H.F. currents leaking into the L.F. amplifier, I notice that the diagram shows the components connected as follows: grid side of .01-mfd. condenser to one end of .25-megohm grid leak, other end of .25-megohm grid leak to grid of L.F. valve, and one end of the usual grid leak, remaining end of this grid leak to G.B.—

"Surely the usual grid resistance for the valve should be connected to the junction of the .01-mfd. condenser and the .25-megohm leak, and not actually to the grid of the valve: for, so far as I can see, the effect obtained with the connections actually shown would be that of the usual potentiometer volume-control, except that, of course, this would be a fixed one?"

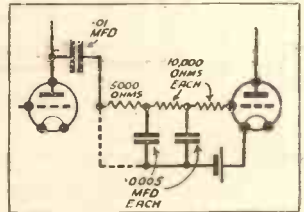
You are perfectly right. If the usual leak were of the order of .25-megohm, half the L.F. voltage (or more) might well be lost.

Obviously, the correct connection is as shown in Fig. 2. But, of course, you know the voltage is only 6 D.b's! But perhaps you have not yet come across the D.b's maniac.

"RESISTANCE-PARALLEL" FEED.

A. E. (Newcastle).—"Why is the method of using an L.F. transformer, known as resistance-parallel

A HETERODYNE FILTER.



The arrangement mentioned in the answer to S. L. (Ilford) for cutting out a heterodyne whistle.

The L.F. End—continued

feed, or auto-coupling, claimed to give better results than the normal method of using this component?"

Quite frankly, I find I cannot keep up with the nomenclature so quickly adopted by my brother technicians, but I think I know what you are asking me. You mean what is supposed to be better in method 1 than in method 2, as illustrated herewith?

The advantages claimed for method 1 is that no direct current passes through the winding of the transformer, as it must do in method 2. If the current passes through the transformer it magnetises the iron core and may produce distortion, because of varying magnifications at different values of (superimposed) A.C. current, and may produce a less overall magnification.

A QUESTION OF DECOUPLING.

W. H. B. (Eltham).—"I have been advised that when a pentode is used in the output stage of an A.C. mains receiver, coupled to the loudspeaker by a tapped choke output filter (the loudspeaker leads being taken from the centre point of the choke, and H.T.—), it is necessary to use a choke decoupling device in the H.T. feed to this valve to prevent probable coupling with the anode current supply to the remaining valves of the receiver.

"As all the other valves, that is, detector and two S.G. H.F., are individually decoupled. I am doubtful whether this advice is correct."

So am I! The only point is that decoupling must be thorough.

The danger is that the decoupling between detector and last stage is not good enough if only the detector is decoupled (never mind about H.F. valves; these decouple easily).

Thus, to make assurance doubly sure, it might be better to decouple both output and detector. It's merely a question of degree, not principle.

LOW NOTES AND SHUNT-FED L.F.T.

B. R. (Brentford).—"Some time ago I was attracted by the scheme of deflecting the anode current of a fairly low impedance intermediate L.F. valve through an L.F. choke, and feeding the A.C. component via a condenser to the primary of the L.F. transformer. The idea was, of course, that the transformer characteristics would not be affected by the steady current, and better reproduction would result.

"Since this alteration I have found that there is a noticeable increase of bass reproduction, and, in fact, on some notes my moving-coil speaker makes a 'juddering' sound. I am somewhat puzzled by this

effect, and should be pleased if you could suggest the cause and, of course, the cure."

I can only suggest that removing the current increased the inductance of the transformer, and that this increased bass reproduction, and that this produced a too great voltage swing in the following stage, and thus you suffered from blasting.

The secondary of your transformer might be shunted now by a resistance decreasing the inductance, but this will result in some top cut-off. You might increase the possible grid swing of the last valve, and be sure that the anode impedance of the last valve is sufficient even for the lowest notes.

TRAMWAY NOISES.

D. O. (Plumstead).—"I have a three-valve receiver which works perfectly, but unfortunately, I am situated rather near a tramway system. I find that when a tram passes my house, I get a crackling noise in my loudspeaker.

"How can I cut this out?"

I doubt whether you can overcome tramway noise by doing anything to your receiving set. It is, however, worth while trying some things.

For instance, your aerial should be as far away from the tram route as possible, and your set should be reasonably selective and not too sensitive for the station or stations it is desired to receive. The royal road to the elimination of tramway noise is to alter certain connections in the motors of the tramcar, or to get the tramway authorities to use a special form of collector bow.

USING "STOPPERS."

B. S. (Nottingham).—"I notice that in certain cases where tramway interference is very bad, 'stoppers' have been inserted in the trolley arm by

the authorities. How do these 'stoppers' work?"

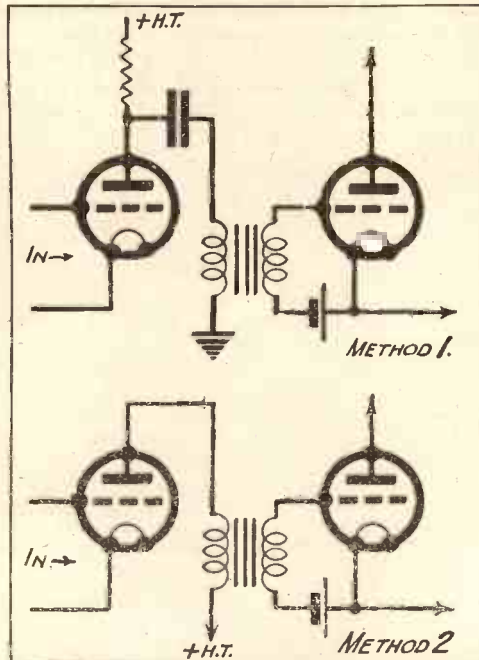
"I always thought that this form of interference was caused by sparking between the trolley wheel and overhead wire.

The spark takes place, as you say, between collector and overhead conductor, but the spark is only one of the factors contributing to "tramway interference."

The spark sets up electric oscillations between earth and (aerial) overhead conductor. The aerial conductor and the tramway arm and the tramway wiring radiate the effects of these oscillations.

The idea of a stopper is to damp out, prevent, scotch, kill, these oscillations set up by the inevitable spark.

HOW IT IS DONE



The "parallel-feed" scheme mentioned in the answer to A. E. (Newcastle) is shown in the top figure. Method 2 is the conventional circuit for an L.F. transformer.



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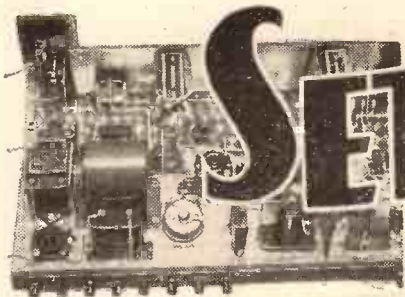
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LANCASHIRE



SETS THAT HUM

There are many causes of hum. Sometimes it is a relatively small matter that can be put right by making a slight adjustment to the layout or by using a larger mains unit.

SHIFTING THE MAINS UNIT.

B. R. (Tooting).—"I used to be troubled with a loud hum when using my S.G. detector and pentode receiver with an A.C. eliminator. The eliminator was normally kept close to the L.F. stage, but on moving the unit to the opposite (H.F.) end of the receiver, the hum ceased and programmes were received with a background of absolute silence.

"Why did the position of the H.T. unit show such a marked difference in results?"

Probably merely because the H.T. transformer's magnetic field leakage coupled with the iron-cored choke (or transformer) in the pentode anode circuit (or any other transformer and choke in the L.F. circuits). It was a pure induction effect of 50-cycle currents in the receiver L.F. circuits, and when you moved the H.T. unit away from the L.F. circuits the inductive effect was eliminated.

Naturally you can't induce 50-cycle effects into high-frequency circuits designed to respond to million-cycle effects, and so putting your eliminator near the H.F. end gave you that "background of absolute silence."

IS IT OVERLOADING ?

J. N. (Cattford).—"I have an A.C. mains unit which was giving very satisfactory results when used in conjunction with a straight two-valve receiver. I have now converted this receiver into a three-valver by adding an extra L.F. stage, and I have placed a super-power valve in the last socket.

"When I attempt to use the mains unit there is now a loud hum, and signals are rather distorted. Could this be due to the fact that the mains unit is now being overloaded?"

Your explanation is correct—almost certainly, I should say. The mains unit constitutes a rectifier which feeds unidirectional pulses of electricity into a condenser. This condenser fills up to the brim and then you can take steady current from it. If, however, the load across the condenser is such that it could never keep full, you become aware of the gulches of electricity feeding into the condenser intermittently. If you want an analogy think of a pump which feeds water into a tank intermittently in gulches. If there is a tap in the bottom of the tank you can get a steady flow of water from the tank even though the pump is putting water into the tank

intermittently. But if you turn on the tap so full that the tank never gets full, you will get an intermittent feed. The cure in your case is a mains unit with greater output, which feeds in more electricity per gulch than the present one.

TACKLING A HUMMING NOISE.

T. R. (Hastings).—"I am greatly troubled with a humming noise which I believe is due to some electrical machinery near me. I have tried a number of dodges in my efforts to cut out interference, but so far have been unsuccessful. Can you suggest anything?"

"My set is a detector followed by two stages of L.F. amplification, and I am using an outside aerial."

Remove the aerial from the set. Does the hum still persist?

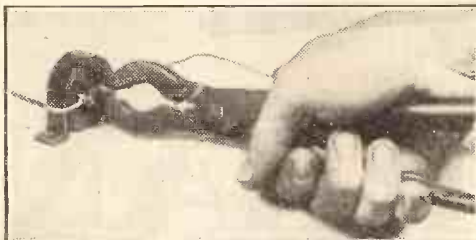
If it does not you are unlikely to be able to remove it without treating the machinery (or the man in charge of it!) in some way.

Are you lighting your filaments from the mains, because if the hum is there when your aerial is removed this may be the trouble. In which case be sure that your grid leaks come to the centre of a potentiometer connected across the valves.

Are grid leaks too high? What is quality like otherwise? Do you use a moving-coil loudspeaker? Is your loudspeaker too near the set and making it pong? Is your set vibrating mechanically? Have you a proper earth?

Answer all these questions and then write to the B.B.C.

A POINT TO WATCH



Small terminals require tender handling. If you attempt to screw them up with a large pair of pliers you will probably strip the thread or break the connection.

HUM FROM THE VOLUME CONTROL.

M. A. B. (Felixstowe).—"With the particular volume control I have in use, each time I touch the knob a humming noise is heard in the loudspeaker.

"I find that if I touch the grid of the valve, a similar hum is heard. An examination of the volume control has shown that there is a metal ring just under the knob outside the panel, with the result that when I touch the volume control, I really place my fingers on the grid of the valve."

The body has considerable capacity and a resistance which varies very much, but is of the order of hundreds of thousands of ohms. You, sir, are a leaky condenser.

I know one expedient which is nasty but very effective, and that is wrap the volume control knob in insulating tape. That should do it.



MOTOR-BOATING and HOWLING

Low-frequency instability can completely spoil your results, but there is no need for it to occur if proper precautions are taken. The use of adequate decoupling is the correct safeguard.

SUPER-POWER VALVE TROUBLE.

V. C. (Maldon).—"I have a det. and 2 L.F. receiver run from an H.T. eliminator and, irrespective of how I adjust grid bias, a milliammeter in the plate circuit of the last valve still kicks on the loud passages.

"If I use a super-power valve in the last stage the set immediately starts to motor-boat. Surely there must be a solution?"

There may be one or two causes of your trouble. (a) Insufficient power in your eliminator; (b) a wrong impedance in the anode of the last valve.

It is (a) the kick would be mostly downwards on loud passages; if (b) it could be either way.

Then there may be insufficient H.T., which is another way of saying (a). It's all so difficult without the knowledge of the values which you are using.

As to motor-boating, this is commonly due to a lack of decoupling, but again a lack of eliminator power and insufficient value of smoothing condenser would produce the effects.

1. Does your eliminator give you sufficient current to operate the valves properly?
2. Have you at least 6-mfd. condenser smoothing?
3. Is the penultimate stage decoupled?
4. If you are using a moving coil are you sure the output transformer is right? If a moving-iron speaker and choke feed, is the choke good and big?

A NASTY ONE!

M. K. (Roehampton).—"In a receiver which I constructed recently, incorporating resistance and transformer-coupled stages, an output transformer was used for coupling the loudspeaker to the last valve.

"Severe L.F. instability and howling was experienced, but when a choke and condenser output filter was substituted for the output transformer quite satisfactory results were obtained. What was the reason for this peculiar effect?"

"That's a nasty one! Was it that the values of the transformer-inductance ratio, etc., were wrong? They must have been different from the choke, considered as a one-to-one transformer, which after all is only what it is.

If, for example, the effective anode impedance using the transformer was too high, the magnification of valve and transformer was high, and in the absence of proper decoupling might set up instability.

The choke might have a less effective anode impedance with consequent less magnification, with consequent less tendency to instability.

Why not try the transformer again, but decouple very carefully?

A RISING HOWL.

R. N. S. (Bedford).—"I recently constructed a new set which before placing in the cabinet I tried as a rough hook-up. When I switched on, a loud howl, building up in intensity, was the only result, and I had to switch off.

"After trying various things, I switched on again, and signals were received minus the howl. I happened to move the loudspeaker, and immediately the howl started again.

"I am undecided as to whether the rough hook-up is to blame or the loud speaker, and I should be glad therefore of your advice."

This is a case where the loudspeaker sound output is impinging directly upon the valves themselves and making these valves "pong."

Strike your detector lightly with your finger. The loudspeaker emits a "ponging" noise. This noise may be powerful enough to strike the valve and cause it to continue ponging, which continues the noise in the speaker, which increases the ponging in the valve, which—and so on and so on until a steady howl is built up.

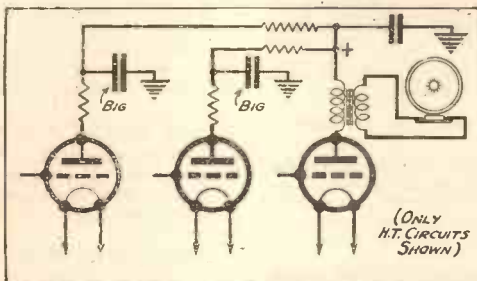
The remedies are either to remove the speaker from the set and so cut down the effect of the sound from the speaker acting on the valve, or to pack the valve with cotton wool or anything else to stop the ponging effect.

"THE CIRCUITS ARE UPSET."

G. B. R. (Mundsley).—"I have a four-valve receiver which has been working well for over two years. I recently acquired a moving-coil loudspeaker, complete with built-in transformer, and having removed the choke output filter in the receiver, connected the speaker transformer terminals to the anode of the power valve and H.T. +. Severe motor-boating was evident with the speaker and transformer.

It's very difficult to say categorically it is due to such and such. In general, motor-boating takes place because of retroactive couplings from stage to stage—a coupling which may be due to a variety of causes which may act singly or together.

TO PREVENT MOTOR-BOATING



The fundamental cure for motor-boating is to decouple thoroughly the different anode circuits. Such decoupling applies particularly to the detector valve.

Motor-Boating and Howling—continued

There is a fundamental cure, and that is to decouple one stage from another. One loudspeaker works; another doesn't. Presumably, the feeds are the same. But the anode impedances are not, and this has upset the circuits. So decouple as shown in the diagram.

SUPER-HET TROUBLE.

H. K. (Luton).—"I have recently constructed a super-heterodyne receiver with a built-in speaker, and have struck a somewhat difficult snag.

"If I tune in a fairly powerful station at moderate strength, results are excellent: but if I increase the volume an extremely loud howl develops which quickly becomes unbearable. This is not due to the mains, as the receiver is operated from H.T. and L.T. accumulators, and there are no mains installed near by.

"When the receiver is operated on a distant station with the volume control almost fully on, results are normal, and I am at a loss to account for the trouble experienced, as the receiver seems to be perfectly stable."

You are suffering because the sound output from the loudspeaker is impinging upon the valves. This makes the valves "pong," which makes the loudspeaker sound output give a pong, which pongs the valves more, which makes a bigger sound output, which—and so on and so on.

The process will not start unless the sound output is pretty loud, and this is obviously more likely when tuned to the local rather than the distant station. The cure is to mount the valves on very good spring holders, and/or to wrap them in cotton-wool, and to stop the speaker from making the box which contains the set vibrate.

In general stop the sound output from the loudspeaker impinging on the valves, particularly the last detector in the super.

THE EFFECT OF A RESISTANCE.

E. H. T. (Manchester).—"In my receiver, which incorporates two L.F. transformer-coupled stages using indirectly-heated A.C. valves, a very high whistle puzzles me when receiving a strong transmission, but the connection of a 5,000-ohm resistance across the output choke prevents this fault, without impairing the tone of the reproduction.

"What is the cause of the whistle, and why does the addition of the resistance stop the trouble?"

A little difficult to answer from the information given. You say there's a high note when receiving a strong transmission. Yes, but isn't there some-

times the same whistle when receiving a weak transmission, too?

I think there is—and I shall assume there is. And I shall give my explanation thus:

When two stations transmit on two separate frequencies of carrier-wave which are 9 kilocycles different, they produce in a receiving set output a "note" of 9,000 cycles (9 kilocycles that is, and equal to their difference frequency).

Of course, if the low-frequency circuits of the receiver are designed so that they give little or no amplification at the higher frequencies (say from 6 to 9 thousand cycles sec.), this "beat note" between the carrier-waves of two different stations will not be heard.

Connecting a resistance across your choke probably lowers the amplification of the valve at high frequencies, and if the high-frequency circuits do not amplify the high heterodyne, a beat note or 9-kilocycle (second frequency difference note), or whatever you like (or I like, in this instance) to call it, you do not hear this note.

On the other hand your low-frequency circuits may be oscillating and the connection of the resistance across the choke may produce sufficient damping and prevent the oscillation.

To prove what is happening tune your set in the daytime to (say) the North Regional (because it's close to you), and listen if the note is there. If it is, it's low-frequency oscillation. If it isn't it's heterodyne. Now take your set and detune it so that it does not pick up any station. Is the note still there?

If "Yes," it's certainly pure low-frequency oscillation, and so try decoupling. If "No," but if the note comes back on North Regional in the daytime, it's low-frequency oscillation caused by high-frequency getting into the low-frequency circuits.

HOWLS WHEN L.S. IS TOUCHED.

T. C. M. (Bradford).—"Why does my set squeal when I touch the loudspeaker terminal?"

"Apart from this annoying howl, the set functions perfectly well, and the quality of reproduction is excellent."

Probably a low-frequency reaction effect of some kind. The capacity of your body is sufficient to throw back energy into earlier valve stages.

This causes oscillations and these quench themselves, but having quenched they restart . . . nothing forces them to stop except themselves . . . and stopping and starting some thousands of times a second they throw in and subtract energy from the loudspeaker some thousands of times a second, and, of

One method that is sometimes successful in stabilising a transformer-coupled amplifier is to join a .25-megohm resistance across the secondary.

course, the faithful loudspeaker howls at its treatment.

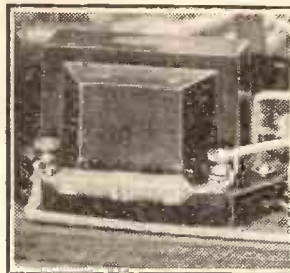
A PIN WILL DO!



Don't let the hole in your valve get stopped up. It can be kept clean with the aid of a pin.

receiver seems to be perfectly

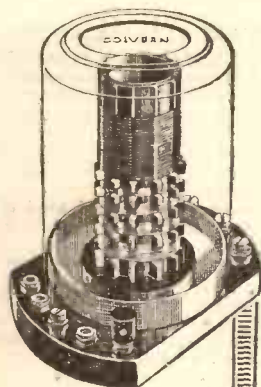
TRY THIS!



course, the faithful loudspeaker howls at its treatment.

COLVERN

-T.D.COIL



AN UP-TO-DATE COIL WITH
UP-TO-DATE FEATURES

TYPE T.D., an entirely new COLVERN COIL, designed to give super selectivity on both long and broadcast wave-bands.

The coil is completely screened, giving a very neat appearance, and incorporates tapped aerial coupling and reaction, while the four alternative aerial tappings are arranged as sockets with a wander plug.

The first two tappings give aerial couplings similar to those normally employed but with greatly increased selectivity.

Nos. 4 and 5 give a high degree of selectivity with weak aerial coupling—suitable for use in a 'swamp' area.

A most important feature of this coil is that there is no break through on the long wave-band from B.B.C. stations.

TYPE T.D. . . . Price 8/6

Our 1933 Booklet Radio List No. 10 is now available and free on request.

COLVERN LIMITED
MAWNEYS RD., ROMFORD, ESSEX

SOME ACCUMULATOR WRINKLES

Look after your L.T. and it will give you years of unfailing service.

SURFACE LEAKAGE.

W. S. L. (Leyton).—"I am using accumulator H.T., and I find that a certain amount of leakage occurs. In consequence the cells tend to run down rather more rapidly than they should. Can I do anything to stop this?"

Each cell can stand on porcelain insulators, for one thing. The porcelain needs putting well under the accumulator.

Then a piece of good hard wood itself supported on porcelain makes earth leakage a minimum.

Then there is leakage over the top of the accumulators. It is possible to insert insulating switches between blocks of cells of 50 volts per block, say. These are "dissed" when not working.

SEDIMENT IN THE CELL.

B. V. S. (Clacton).—"My receiver is rather heavy on filament current, and to satisfy its requirements in this matter I purchased about a year ago a rather expensive six-volt accumulator battery of high capacity. This I have given a weekly charge in strict accordance with the maker's instructions and, in general, have done everything to maintain the battery in good order.

"I have, however, been somewhat alarmed to notice that there is a thin film of sediment at the bottom of each of the three glass containers. The battery is giving excellent service and appears to be retaining its charges in a normal manner.

"Does the film of sediment indicate that anything is wrong?"

Every battery sediments a certain amount. There is nothing to prevent this. It can be minimised by careful treatment.

When the sediment gets so high that it touches the plates, then it is time to do something. Usually one cleans out the container, first removing the plates. This is possible with glass containers and unsealed types of accumulators, but with typical wireless batteries it is a maker's job.

CORRODED TERMINALS.

R. K. (Norwood).—"I have found great difficulty in keeping the brass terminals on my low-tension accumulator clean and free from a greenish deposit. What is the cause of this deposit, and in what way can I prevent this?"

The best way to keep copper sulphate away from terminals is to prevent acid spray and acid fumes attacking the metal. Thus, thoroughly clean the terminals once and for all, then get some petroleum jelly or vaseline and smear this over the bright parts of the terminal (this keeps the acid away).

From time to time wipe off the old vaseline, clean things up, and put on a new coat.

CHARGING H.T. CELLS.

H. D. (London).—"I have a battery of H.T. accumulators of '5,000 milliamperes' capacity, giving a total of 140 volts, and for which the local electrician charges me six shillings for re-charging.

"The D.C. mains are now available at my residence, for which I pay approximately fourpence per unit.

Would you please tell me if it would be cheaper for me to recharge my own accumulators, or would the local electrician's charge still prove more economical?"

But you do not tell me the voltage of your D.C. mains. Nor do you tell me if you pay a power rate, which is usually cheaper than a lighting rate.

Let us make some assumptions. Your mains, let us say, are at 220 volts. You pay 1d. per unit for power. You require to charge at 25 amperes for 20 hours, say. The total cost will be $01. \times 5 \times 220 \times 1$ divided by 1,000 pence. I make this 1.1 pence every time you recharge.

At 240 volts and 4d. a unit it would cost 4.8 pence.

IS IT THE BATTERY?

H. McG. (Glasgow).—"Although the makers of the L.T. accumulator in my portable receiver state that it is impossible to spill any of the acid under any circumstances, I find that there has been some leakage of acid and the 'floor' of the receiver is quite damp.

"The performance of the receiver has also been falling off lately, and recently the reaction control ceased to function entirely although I am unable to discover any obvious cause for this, such, for instance, as a run-down H.T. battery.

"Do you think that the spilt acid can in any way be responsible for the present poor performance of the receiver?"

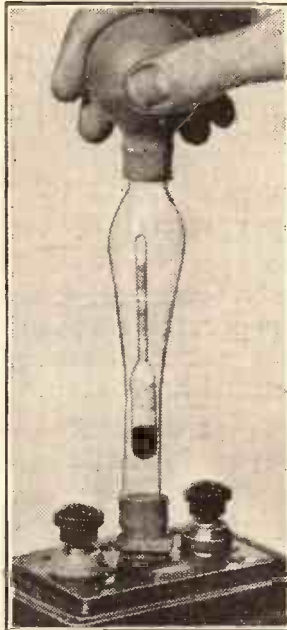
Makers are nearly always right, but they cannot get over occasional faulty workmanship.

It may be your accumulator is faulty and leaking. It may be it does spill, of course, but in view of what the makers say this is unlikely.

It may be that you charge your accumulator in situ and that acid spray makes it look as though the acid were leaking. It may be that those who charge your accumulator for you stand it in acid and let the spray damp it and everything else.

See if the accumulator when it comes back from charging is clean. The deterioration of the set could come about by acid getting on to components or by the level of the acid in the accumulator being too low (due to leak).

WANT'S CHARGING?



Check your L.T. battery with a hydrometer and do not rely solely on a voltmeter test.



DO YOU KNOW THIS?

You must often have asked yourself these questions which Capt. Eckerley deals with in his own inimitable way.

WHAT IS OHM'S LAW ?

M. S. (Tilbury).—"I am a beginner, and I have often see the words 'Ohm's Law' mentioned in articles. Will you please explain what Ohm's Law is?"

I am glad that, as a beginner, you are beginning at the beginning and not at the ending, like so many beginners!

Ohm's Law expresses the relationship between electrical pressure acting around a circuit, to resistance to electric flow in that circuit, and to the rate of electric flow in that circuit.

Pressure is volts. Resistance is resistance, and rate of flow is amperes.

Consider a water pump as shown in the diagram forcing water round a pipe. As the pump is driven faster the pressure it exerts on its outlet and the suck it exerts on its inlet is greater; the difference between the push and the suck is the pressure exerted by the pump.

If you put a flow meter in the pipe, then, as the pressure of the pump is increased, the registered rate of flow will increase. If the pipe (with a given pressure) is narrow and furred-up inside, it will take a big pressure to make a given flow.

If the pipe is large and smooth it will take a less pressure to make a given flow.

There is thus a clear relationship between pressure, resistance, and rate of flow. Electrically, the pump is a battery having a voltage, the pipe is the conducting circuit, and the rate of flow is measured in amperes and is called current.

The greater the pressure or voltage, the greater the current for a given resistance, the greater the resistance for a given voltage, the less the current.

If we call E voltage, R resistance, and I current, then $E = R \times I$. $I = E$ divided by R. $R = E$ divided by I. This comes out in the right quantities if E is expressed in volts, I in amperes, and R expressed in ohms.

That is Ohm's Law. It applies to alternating current as well as direct current, but any resistance to flow is then called impedance.

THE MEANING OF HETERODYNE WHISTLE.

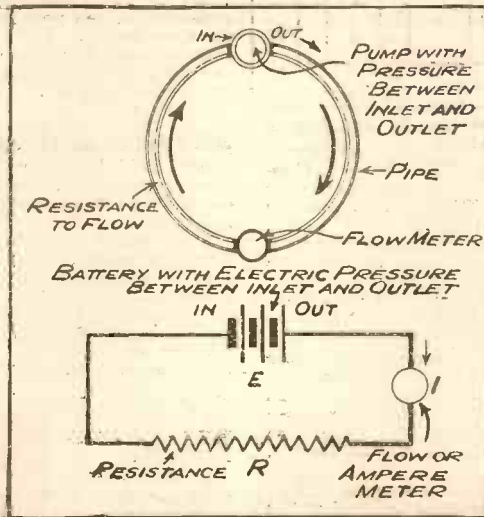
D. L. (Dulwich).—"I am puzzled as to the precise meaning of heterodyne whistle. Is this note caused by the beating of two carrier-waves, or by the mutual interference of the two sets of sidebands? How is it that a heterodyne note often varies in volume in spite of the fact that the two interfering stations apparently maintain a constant volume?"

The steady heterodyne note is due to the beating together of two carrier-waves, a beating audible after detection only, of course.

The heterodyning of sidebands also takes place, but this does not set up a steady note, rather it is a sizz-spizzling noise well described as "monkey chatter."

The variation in volume is due to fading.

THE ANALOGY OF THE PUMP



This is an illustration of the most important and valuable law in electricity and radio. Without it we should be almost powerless to design electric motors, lighting supplies, radio sets and transmitters, and a sound understanding of the simple law is essential before you can really grasp the principles of radio.

WHY CALL IT "TRANSFORMER?"

B. W. (Hanwell).—"I should be pleased to know exactly why an L.F. transformer is known by this name. So far as I am aware the function of this component is to amplify, and therefore the name seems misleading."

You cannot amplify by means of a transformer if by amplify you mean increase power. If I have 10 watts of energy given me I cannot by any conceivable means make this into 20 watts without adding another 10 watts.

True, a transformer may amplify volts; you can put 2 A.C. volts into a primary and get 200 A.C. volts from the secondary.

But volts themselves do not represent power.

If I put in 2 volts and 2 amps. into the primary (in phase) I put in 4 watts. If I had a 100 per cent efficient transformer I should have 200 volts at the secondary, but only $\frac{1}{50}$ ampere, because $200 \times \frac{1}{50}$ (secondary power) = 2×2 (primary power) = 4 watts.

Of course, when you do not use power (appreciably), as in a low-frequency amplifier transformer, you do get an apparent gain because, say, 2 volts 0 amp. from one valve may be made into 6 volts input to the grid of the next valve.

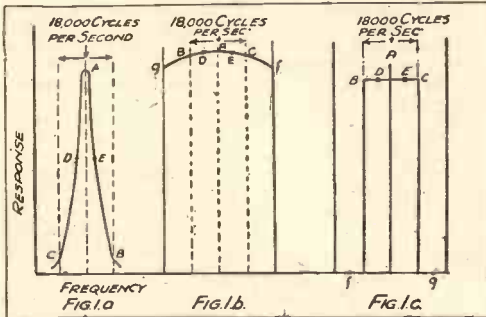
Do You Know This?—Continued.

WHY SHORT-WAVERS ARE TRICKY.

J. R. E. (Clapham).—"I am at a loss to understand why a short-wave set should be any more trouble to operate than an ordinary broadcast receiver. The difference between the long waves, i.e. 1,000 metres, and the medium waves, i.e. 300 metres, is 700 metres, and yet I cannot notice any difference in the operation of the set.

"I am told that if I attempt to receive on 30 metres, and in this case there is only a difference of 270 metres, I must expect trouble in operating the set. Why?"

"FLAT TOP" TUNING



The band-pass principle is explained by these different response curves.

You are confusing relative quantities with absolute quantities upon the one hand, and you are not appreciating that frequency difference is not directly proportional to wavelength difference.

On the question of absolute quantities you must appreciate that a circuit might present no difficulties when working on 300 metres or 1,000 metres, or 10,000 metres, or 20,000 metres; in all these cases it might be perfectly stable because small capacities would be swamped by large ones.

At 30 metres, however, you can appreciate that stray capacities might become more. You can drive a motor-car at 10, 20, 30, 40 or 50 miles an hour and the behaviour of the car seems very much the same; but got up to 200 miles an hour, and there is an awful difference between 200, 300, 400 and 500!

WHAT IS BAND-PASSING?

M. D. R. (Ealing).—"I have recently heard quite a lot about band-pass tuning. What exactly is this particular system of tuning, and what advantages does it confer?"

When a broadcasting station transmits a programme it can be shown that it emits waves of several different frequencies. Thus, for example, when a station is modulated from the output of the microphone into which a man is talking or an orchestra playing, the station sends out a wave of frequency, say, 1,000,000 a second, and a host of other waves, grouped around this central frequency, having frequencies up to 1,000,000 plus 10,000 and down to 1,000,000 minus 10,000.

These added and subtracted waves are called "side-bands." The object of a receiver is not then to tune-in only to one frequency, but to a band of frequencies about 20,000 cycles wide (owing to the fact that the carrier-waves of stations are separated by only 9,000 cycles this band is actually in practice

about 18,000 cycles wide: 20,000 would give better reproduction).

The method by which receivers work generally is that they include in their design resonant tuned circuits which respond much more to one frequency than to another. If a high-frequency circuit is said to be very selective it has a shape something as shown in Fig. 1a.

You will immediately realise that this circuit gives full response to the waves at one point, A, but nothing like a full response at points B or C, or even D and E.

This means that the upper side-bands will not be picked up at full strength so reproduction will suffer. (Who doesn't know that if you apply intensive reaction and make the resonance curve very sharp that the speech or music becomes very "heavy"?)

If you were to make a response as in Fig. 1b you would reproduce all the side-bands all right, and the response at A, B, C, D, or E would be about equal.

Unfortunately, however, if there was another band of frequencies next door to the station you wish to receive, the response at f and g would be so great that there would be interference between one station and another, and your receiver would not be sufficiently selective. Obviously, therefore, the ideal response curve is as shown in Fig. 1c, the response at f and g being practically nothing, but the response at B and C being full.

SOME FINAL REMARKS.

As I said before, an ordinary resonant circuit does not produce this type of response. It is the object of a band-pass filter to give a response as shown in Fig. 1c.

The principle of the band-pass filter is to use two highly resonant circuits and couple them close together, when response approximates to that shape, as indicated in Fig. 1c. I have not got space here to explain the many ways in which this can be done, but there are a great many articles in current wireless literature upon the subject.

A USEFUL TIP



WHY "ACCUMULATOR"?

S. McG. (Hampstead).—"Why is an accumulator so called? What does it accumulate?"

Well, acid spray, and dust, and vaseline, and money for charging it, and curses when it runs down . . .

No! Seriously, an accumulator is so called because it stores (or accumulates, I suppose) electricity.

When you charge an accumulator you appear to store that charge in the plates, and you can release the charge once more when you want to. An accumulator is a kind of tank into which you pour electricity.

It pays to keep the lead-in insulator dry, and this can be readily achieved by punching a hole in the end of a shaving-stick holder, and slipping it on to the lead-in terminal.



YOUR OUTPUT STAGE



Your reproduction is largely dependent upon the arrangement of the last amplifying stage, and once you get this right you are well on the way towards obtaining perfect quality.

THE CHOKE IMPEDANCE.

M. R. (Accrington).—"Can you kindly inform me why a 20-henry L.F. choke is normally specified for a choke-filter output? Why not 15 or 30 henries?"

I expect it's a good all-round figure! And the choke is never 20 henries! But it sounds all right. Let's see some values, though.

Twenty henries at 50 cycles has an impedance of 6,000 ohms, hasn't it—about? So with an ordinary low-impedance output valve that's nearly enough. And at 1,000 cycles the impedance is theoretically 20 times as much, i.e. 120,000, and that's quite enough, but the loudspeaker is effectively in parallel, and so cuts it down.

Make the inductance 15 henries and you get rather a low value for the two frequencies—too low in a great many cases. Make it 30 and, while it's better for the two frequencies, you can have too much, and it gets more expensive and more bulky.

So I suppose 20 henries with the average loudspeaker, which reproduces very little below 1,000 cycles, and the average low-impedance output valve is a fair compromise. Of course, a "designer" combs out his values for each case.

WHAT SIZE CONDENSER?

L. C. (Dover).—"I notice that the value of the condenser used is always large; say, about 2 mfd. Is it necessary to employ such a high value, bearing in mind that the average coupling condenser used in an R.C. stage is usually about .01 mfd.?"

Let's work it out: it's quite simple. Fig. 1 is equivalent to Fig. 2, which is equivalent to Fig. 3.

A constant voltage generator, E, Fig. 3, has to pass energy to the loudspeaker, which is a combination of resistance R and inductance L. It is our object to see that at no frequency in the audible gamut will the impedance of C be comparable with the combined impedance of R and L.

In other words, C must not impede the current going into the loudspeaker. Now, L has a minimum and C a maximum impedance at a low frequency.

So we must consider for practical purposes a frequency of, say, 50 cycles/sec. Now, R is about 1,000 ohms, and L about 1 henry (as a minimum).

So the combined impedance of R and L is the square root of the sum of their squared impedances

or root, 1,000 squared plus $6 \times 50 \times 1$ squared, or 300 squared. This is about 1,000. The inductance of C should be a good deal less than 1,000; say, it should be 200 ohms. Well, this means it should be 15 microfarads. So 2 is far short of the right value, but it doesn't matter, because loudspeakers if really given a constant voltage are bass heavy.

The 2-mfd. impedance must be also added to R, the internal impedance of the valve. There is therefore a lot of bass cut, but the tuned circuits and the quality of the speaker adjust against this. Of course, the capacity of the inter-stage coupling condenser can be much lower because the grid leak is of the order of 200,000 ohms, which is equivalent to saying that R in my diagram is 200,000, and not 1,000 ohms.

SHOCK FROM THE L.S.

J. R. N. (Chislehurst).—"I have added an output filter to my set in order to prevent the H.T. from flowing through the loudspeaker windings. To my surprise I find that if I touch the speaker terminals I get a shock. Does this mean that the output filter is not working properly?"

It might do, of course, but you must do this test.

Stop any signals coming into the loudspeaker at all, disconnect aerial switch, and try when the B.B.C. is off, and then touch the loudspeaker terminals.

If you do not get a shock your output filter is blocking off your H.T. D.C. volts. But when you restore conditions of working there are volts of alternating-current modulation, are there not? I mean if there were no volts across your loudspeaker terminals, how is the thing going to make a noise?

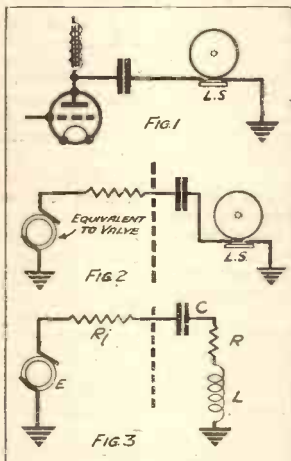
It's possible to get quite unpleasant shocks due to pure H.T. volts of modulation even though all D.C. is blocked off. The cure is not to touch when working.

A SPARK AT THE SPEAKER.

C. A. (Barnet).—"Please can you tell me whether my output filter is faulty? The symptoms are these:

"If I switch on my set, and then disconnect the loudspeaker, taking it into another room, and then connect it to a pair of extension terminals, I get a spark directly the loudspeaker tags touch the terminals. Is this in order, or does it mean that my output filter condenser is leaky?"

"BOILING IT DOWN"



The top figure shows the usual circuit arrangement for an output filter, while the other two sketches illustrate the equivalent theoretical circuits in varying stages of analysis.

Your Output Stage—Continued

Yes, that's all right surely; you are just removing the charge in the condenser.

Thus, if you charge up one plate of a condenser positively, leaving the other free, the other plate becomes negatively charged, and when connected to earth the whole condenser is discharged through the conductor connecting it to earth—in your case the loudspeaker. Do not worry!

AMPLIFICATION AND POWER OUTPUT.

L. A. L. (Andover).—"Can you tell me how I shall know whether I ought to use a super-power or an ordinary-power valve? This is what puzzles me:

"There are two valves by the same maker, one of them has an amplification factor of approximately twice the other and needs only half the grid bias. If I get a valve with the higher amplification factor, I ought to get more magnification, and in consequence there is no need for me to apply such a big signal to the grid as would be necessary in the case of the valve which has only half the amplification factor.

"Why is it necessary to use a valve in the last stage capable of handling a big swing, when one loses so much in amplification by using a valve of this type?"

Amplification is not power. I could get a valve requiring a grid sweep of 0.5 volts to apply 200 A.C. anode volts to my loudspeaker. But the loudspeaker demands power, and the valve I mention might not give that power.

Again, high-amplification valves have high internal impedance. Most loudspeakers have relatively low impedance at lower frequencies. So a high-impedance, high-mag. valve, in not matching the impedance of a loudspeaker load, is not efficient, and will not deliver the required power.

If I use a step-down transformer, then it's all right as far as matching goes, but I have to drop the volts applied to the speaker, and it again comes down to what power I have available.

You have 230-volt mains. You light all your lamps, and warm the house by electricity from these mains. At least, let me assume this.

You have a motor-car which has a magneto. That magneto absorbs hardly any real power to drive it, but it may deliver 100,000 volts! It wouldn't do any good to substitute the magneto for your mains, even though it is a very high-mag. device!

Power—Power—Power—Power! and power is volts \times amps—(with unity power factor, anyway).

MILLIAMMETER CONNECTIONS.

W. E. (Plymouth).—"The connection between the output valve and loudspeaker in my receiver is via

the conventional choke and condenser circuit. I intend inserting a milliammeter in the plate circuit of the output valve.

"Does it matter if the meter is connected between the choke and valve, or must it be on the H.T. battery side of the choke?"

It is much better style to connect your milliammeter on the H.T. side of the choke, but it really doesn't make a great deal of difference. The disadvantages of connecting the milliammeter between the choke and the anode are as follows:

(1) The maximum voltage to earth at this point is greater than if the milliammeter is connected to the H.T. side of the choke, so the insulation of the instrument, particularly if the case is earthed, must be greater and there is a greater risk of breakdown.

(2) The milliammeter might show considerable self-capacity to earth (it is unlikely that it does) and the top frequencies might thereby be cut off.

I personally would like to see the milliammeter at the H.T. end of the choke, particularly if the case is earthed, but if the case isn't earthed I don't think it would make the slightest difference one way or the other.

WHAT WAS WRONG?

P. G. R. (Winchester).—"I recently purchased a new output valve of good make and found that signals came through at good strength and free from distortion for about twenty seconds. Suddenly the signals ceased and the milliammeter in the output stage read 120 m.a. (its maximum reading). I switched off, and after five minutes switched on again, and the same thing happened.

"If the new valve is the cause of the trouble, what is likely to be wrong with it?"

Looks rather as if the valve is giving trouble by going "soft," or looks as if the negative grid potential comes off the grid.

An output valve is usually fairly high-powered and it may be a bit more difficult to pump "hard." But, of course, 99 per cent of such valves are perfectly all right; occasionally one may get a dud.

When a valve is soft it means that there's some gas left inside, and this gas breaks up into ions which carry lots of electricity rather faster than the ordinary electrons emitted by the filament can do through the true vacuum. But if a soft valve behaves incoherently, the hard valve is the only workable proposition.

But after all that, it may be as I said, that the valve is perfectly satisfactory, and the grid-bias battery is failing or the grid connection is broken.

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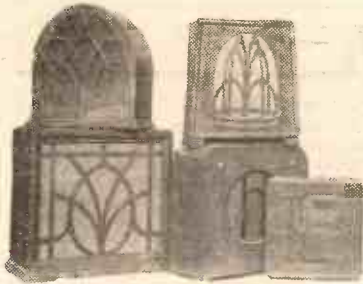
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LOUDSPEAKERS and QUALITY



Those little points about your reproduction need worry you no longer. They are all answered here.

THAT NEW MOVING-COIL.

T. F. H. (Cardiff).—"It was suggested by a friend that to increase the quality from my set I need only purchase one of the many moving-coil loudspeakers at present on the market. I obtained a new loudspeaker and was disappointed with the results.

"Should I have ordered some special type of moving-coil to suit my set, or do moving-coil loudspeakers require special sets?"

No! Yes! No! Yes! Oh!

A good loudspeaker—and all good loudspeakers are not moving-coil speakers, and all moving-coil speakers are not good speakers—requires a good set, and the better a loudspeaker the more critical it is of the set which feeds it.

A loudspeaker which reproduces all the frequencies fed into it reproduces all the distortions fed into it. A loudspeaker which gives a rough impression isn't very particular about the original being rough. So first get a good quality set. Secondly, the "low-impedance" loudspeakers require a step-down transformer.

L.S. EXTENSION WIRES.

J. M. (Barnstaple).—"I am going to run some loudspeaker extension wires from my set to a room upstairs, and have been told that it is advisable to isolate them from the H.T. Would you advise the use of an output filter or an output transformer, and what are the advantages of each?"

Personally, I should use an output transformer if the self-capacity of the leads is likely to be high. Then one uses a second transformer at the loudspeaker and the solution is complete, because by stepping down to the cable and up again to the loudspeaker, one can disregard the cable self-capacity in a simple way.

If the self-capacity of the cable is not likely to be serious, I suggest that comparative cost is the only factor—a good transformer versus a good filter. In any case don't have H.T. running about the house.

MOVING-COIL DIAPHRAGMS.

N. K. L. (Southampton).—"In the case of a moving-coil loudspeaker, what bearing does the diameter and rigidity of the cone diaphragm have on reproduction?"

"Does stiffness improve the high notes, and any increase in cone diameter the low notes?"

Phew! No, sir! This problem involves about ten independent values, as, e.g. position of coil drive relative to cone dimensions, cone dimensions, cone edge mounting stiffness, cone stiffness, cone homogeneity, cone mass, eddy currents in pole-pieces, and so on and so forth.

I, for one, am not such a fool as to think I could tackle the problem, while I am wise enough to suspect the theoretical results of those who have been brave enough, at any rate, to tackle them.

In general, one may say that, at low notes it is

probable that the cone moves in and out like a piston as a whole.

At higher notes, the cone tends to break up, when parts of the cone are stationary and parts move.

This breaking up contrives to be more pronounced and complex as the note is higher. You can damp the edge of an M.C. speaker without affecting most of the high-note reproduction.

SUPER-HET. QUALITY

D. N. (Stroud).—"I am rather keen to make up a super-het. using S.G. intermediate stages, but I seem to remember having read an article in which it was stated that it is impossible to get perfect quality with any receiver of this type.

"I do not understand why it should not be possible to get first-class quality, and would be glad if you would kindly explain matters to me."

I do not understand why this rumour has got round that it is impossible to get good quality out of a super-het. I see no theoretical reason whatever why this should be so.

I have heard most excellent quality from the super-het., more I cannot say, except to wish you the very best results and the most interesting

THIS IS IMPORTANT



time in building a super-het., and to hope that more and more people will realise that this type of instrument does possess several theoretical advantages which might become practical if the practical design were studied *au fond*.

Comparing characteristics. N.N. (Leeds).—"Is there any satisfactory method of determining the output characteristics of a loudspeaker so that one may be compared with another?"

COMPARING CHARACTERISTICS.

"It seems to me that it would be a distinct advantage if the response curves of different speakers were published in the same way as those of transformers."

There certainly are methods, but I doubt if any could be accurately described as satisfactory. The basic idea is to have a microphone which is

Loudspeakers and Quality—continued

calibrated as pressure of air wave against output voltage.

If this calibration can be relied upon, then the calibrated microphone is hung up in front of the speaker. Equal volts are applied at various frequencies to the speaker, the microphone response is measured and, from the calibration, the speaker characteristic plotted.

But if the output sound from the speaker is reflected from the walls of the room, obviously the results mean nothing, because the reflections are different at different frequencies. So the walls of the test room have to be most carefully and expensively treated.

Then standing waves may be set up between microphone face and speaker diaphragm, giving amazing "peaks." These are eliminated by swinging microphone and taking an average reading of the output.

At no instant is the distance between tested speaker and testing microphone the same if the latter is swung. It's all an expensive and, perhaps, rather unreliable method, and one laboratory's results seldom agree too closely with another's. This makes comparison difficult and untrustworthy.

Besides, frequency characteristics are not all of a loudspeaker's performance.

A RATTLING BAFFLE.

W. W. (Stony Stratford).

"I have been using for some time a thin baffle-board approximately 4 ft. by 4 ft. Would there be any advantage in increasing the thickness of this to say, $\frac{1}{2}$ in., or would even 1 in. be better?"

"My trouble, which I am unable to cure, is an annoying rattle on certain notes."

Question.—Does the baffle rattle, or is the rattle due to something other than the baffle?

Answer.—Remove the speaker from the baffle and see if you can hear the rattle. If you cannot hear the rattle it was the baffle, but if you still hear the rattle you cannot blame the baffle.

Advice.—If it is the baffle which makes the rattle, shake the baffle till you locate the rattle, and then use your common sense to cure the rattle in the baffle. Make it thicker, stiffen it with battens, use a 5-ply backing—anything to stop the rattle in the baffle.

But if it is not the baffle that makes the rattle, I am baffled to know what the rattle is. It may be the speaker, or an overloaded valve, or—it may be a host of things. You will, I hope, find the rattle in the baffle and cure it.

RESONANCE FROM THE CASE.

G. T. (Bournemouth).—"For purely artistic reasons, I mounted my loudspeaker chassis inside a square box type of cabinet. The results, however, were not very good and the reproduction was boomy.

I removed the back of the cabinet, and this to a certain extent solved the trouble.

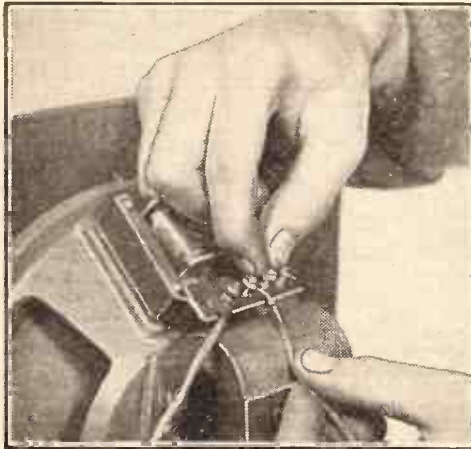
"Why should putting a back into a loudspeaker cabinet give boomy results? Or is there something wrong with my particular cabinet?"

Put your head in a box, and for purely inartistic reasons start talking! You (or your listeners) will thereafter agree that talking in a box doesn't make the voice terribly natural!

The loudspeaker is talking in a box (it talks backwards as much as forwards), and it suffers because it has to set up air waves inside a confined space, and these air waves are reflected all over the place.

Furthermore, the box sides vibrate and give all their characteristic resonances. You can overcome the trouble to some extent by filling the box with slag wool held by netting, or in canvas bags.

MATCHING UP THE OUTPUT



In order to get the best quality reproduction it is essential to use the correct ratio output transformer. A tapped primary makes the task a simple one.

LOUDSPEAKER BAFFLE BOARDS.

H. T. (Bristol).—"Does the size of a baffle for a loudspeaker have any bearing on the output from the loudspeaker? What I mean is, if the loudspeaker is arranged to give a certain output, must I use a larger baffle if I increase the volume,

It's merely a question of frequency characteristic. Thus, a baffle is useful in producing a stronger (directional) radiation of the bass notes.

Imagine the diaphragm of the speaker to move very slowly and imagine there is no baffle. The air, instead of being compressed in front of the forward-moving diaphragm, escapes sideways and behind the diaphragm.

A baffle prevents the escape, or at any rate, makes the path of the escape larger.

As a matter of fact, the required baffle size is a fraction of the wave-length, but the wave-length of sound waves at 50 cycles is nearly 22 ft. and a half-wave baffle would be 11 ft. across. Obviously, physical considerations limit theoretical desires, and "make a baffle as big as may be" is a good motto provided the diaphragm is not already putting too much "bass" in the reproduction.

This latter fault has been frequently noticed with certain types of moving-coil speakers, you will therefore have to use your own judgment to a great extent. If there is comparatively little bass coming from the loudspeaker it would be better to use a really large baffle, but if on the other hand things are already inclined to be "boomy" this would only make matters worse.

Theoretically, there is no connection between the power output from the loudspeaker and the baffle size. It is necessary to prevent the escape when the volume is at low level, if it is desired to retain the low notes. On the other hand, good quality reproduction should be of fairly high volume level, when the bass is good.

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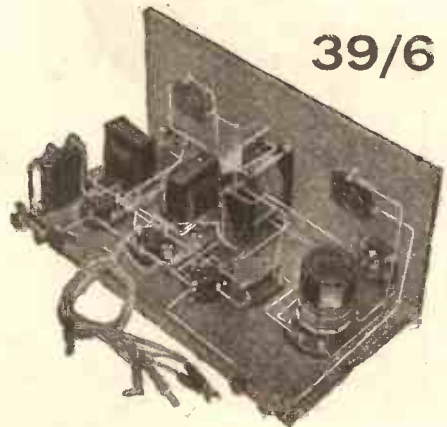
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